AVIATION WEEK

50 CENTS

Look quickly . . . it's a COUGAR!

You need a fast eye to catch the Navy's new GRUMMAN COUGAR in flight. Notice the pluming vapor trails formed by fuel jettisoned from auxiliary wing tanks. Cougar pilots dump extra fuel as a safety factor prior to engaging in combat and before returning to their base. A swept-wing successor to the battle-proved PANTHER, this powerful turbo-jet fighter is now moving off production lines to active operation with the Fleet . . . next move Korea.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETHPAGE, LONG ISLAND, NEW YORK

Contractors to the Armed Forces

Sundstrand opens new Western Research and Development Center!

Another step in Sundstrand's program to expand its service to the aircraft industry

● Increased facilities for improved coordination with airframe and aircraft engine manufacturers will soon be available in the new Sundstrand Western Research and Development Center at Hawthorne, California.

Plans for the new Center, in the near future, call for complete laboratory and test equipment, plus necessary machinery used in basic development work. Attention will be concentrated upon Sundstrand Constant Speed Drives for A-C generators, hydraulic pumps, and specialized hydraulic controls for aircraft.

Three experienced Sundstrand engineers have been assigned to the new Center to supervise these functions—research and design, service, contracts, sales and applications. Call on the Center for assistance on any problem involving Sundstrand's *reliable* research, *expert* engineering, *precision* production.

SUNDSTRAND

SUNDSTRAND AIRCRAFT HYDRAULICS

SUNDSTRAND MACHINE TOOL CO.
HYDRAULIC DIVISION, ROCKFORD, ILL.

AIRCRAFT AND INDUSTRIAL HYDRAULIC TRANSMISSIONS, PUMPS, MOTORS AND VALVES • OIL BURNER PUMPS • AIR SANDERS
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B.F.Goodrich

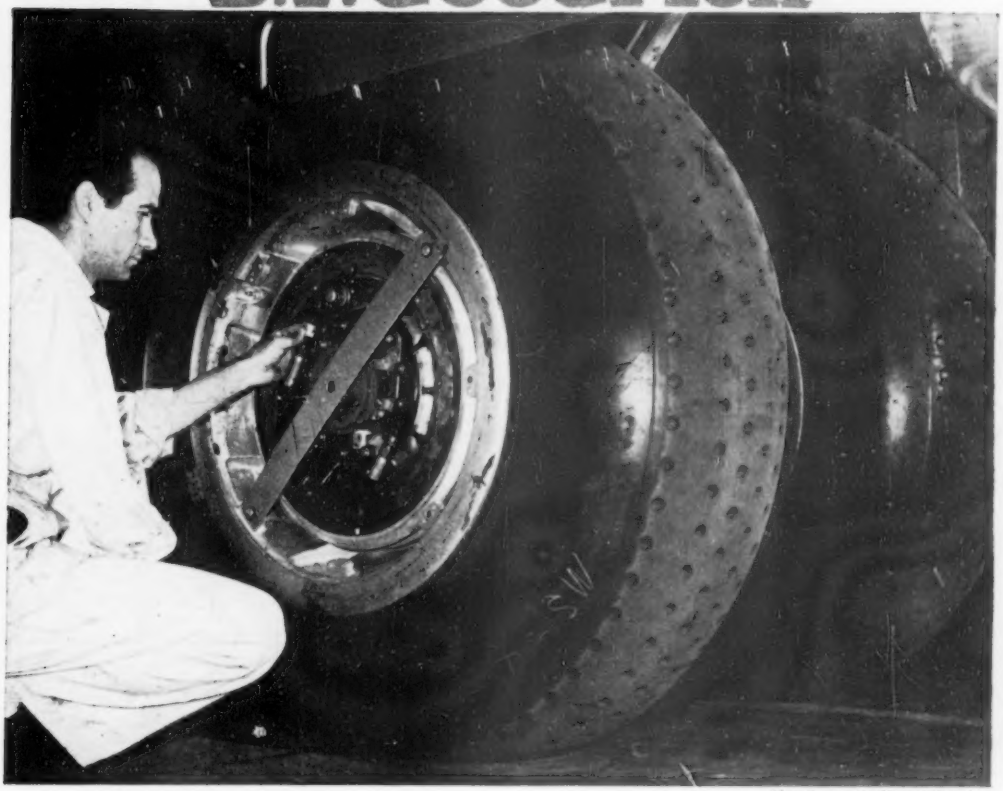

Photo Courtesy Northwest Airlines, Inc.

Brings down the cost of bringing down a Stratocruiser

IN LESS than three years, 54 Boeing Stratocruisers have flown more than 80 million miles, have carried more than 1,400,000 passengers. These famous double-decked skyships are used by four major airlines. And every plane is equipped with B. F. Goodrich Expander Tube brakes. One big reason: to keep down landing costs.

B. F. Goodrich Expander Tube brakes last longer because the braking action covers a full circle, spreading the wear more evenly. Retractor spring action eliminates wear due to drag. Ventilated shoe dissipates heat more rapidly, adding to the life of the parts. Many parts found in other brakes are eliminated. Relining of the brake can be handled with a screwdriver and pliers.

The brake block in B. F. Goodrich Expander Tube brakes provides greater, more even contact between the lining and drum. It permits greater brake loading without overheating. Because there are no rivets, it uses all the lining. That means full, positive braking almost down to the metal backing.

Northwest Airlines is getting added savings by using B.F.Goodrich dimpled tires on their Stratocruisers. They switched to dimpled tires after they gave 20% more landings per tire in tests on DC-4 equipment. A BFG development, the dimple-like indentations in the tread provide better distribution of the tire load and reduce exposure to tread cutting. Retreading is simpler, carcass rejections are fewer. And a longer lasting cord construction cuts down separation.

B. F. Goodrich Expander Tube brakes and dimpled tires are developments of BFG research and engineering. Other B. F. Goodrich products for aviation include heated rubber, De-Icers, Avtrim, inflatable seals, Pressure Sealing Zippers, fuel cells, Plastilock adhesives, Rivnuts, accessories. *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.*

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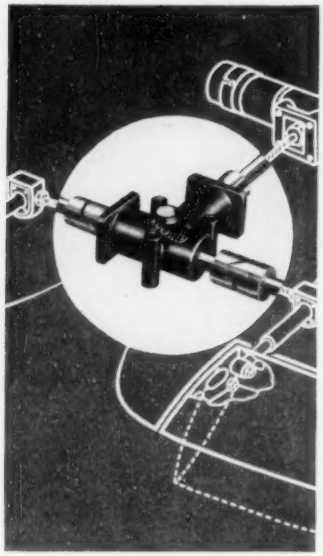
TRIM TAB CONTROL SYSTEM



A 3-way ANGLgear® right angle bevel gear unit supplements an R-118 Rotorac® Electric Rotary Actuator in this typical *Airborne-actuated* system. ANGLgear—with the capacity of units many times its size—is ideal for such close-quarter applications. Its compact design, hardened gears, ball bearings, flanged end mountings, 3-bolt side mountings, and an internal pilot on the mounting ends are plus features.

Two basic sizes with three ratings are fully described in I. A. S. Aeronautical Engineering Catalog. See it for data.

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Aviation Week

ABP Member ABC

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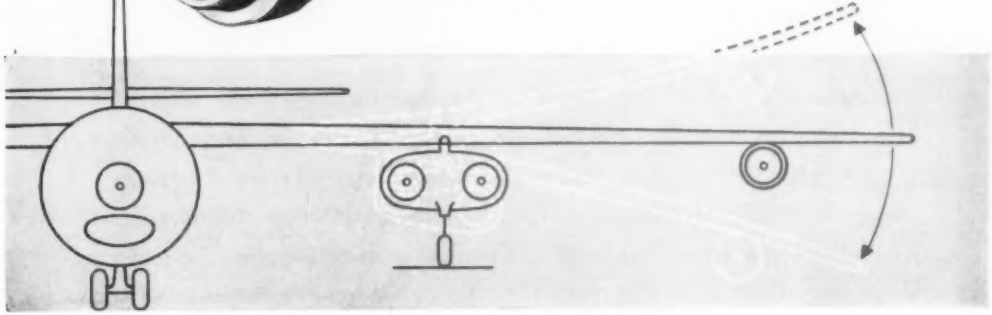
NEW!

Self-Aligning Torque Tube Type Bearing

Solves Control Problem in Wing Deflection

Specifically designed for hinge applications and push-pull controls on modern high speed planes, the new Fafnir torque tube type, *external self-aligning* ball bearing provides friction-free rotation when wing sections and other members are deflected. It is a variation of the AN 202 KP-B series, and is available in the same bore sizes. This space-saving, weight-saving bearing is protected by Plya-Seals and is pre-lubricated at the factory. Send for complete data.



DESIGN ADVANTAGES OF THE NEW SELF-ALIGNING CONTROL BEARING

(1) simplifies application
(2) eliminates parts
(3) reduces costs
(4) insures minimum weight and space
(5) incurs no reduction in bearing capacity

Working with aircraft designers to solve this problem is another example of the Fafnir "attitude and aptitude" . . . a way of looking at bearing problems from the designer's viewpoint, and aptitude for coming up with the right bearing to fit the need.

The Fafnir Bearing Company
New Britain, Connecticut

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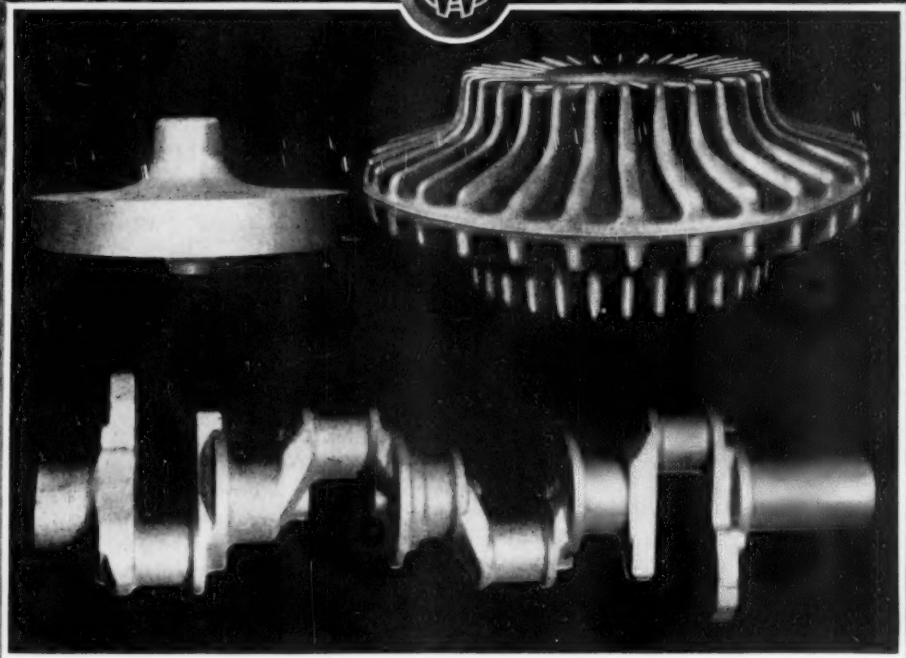
MOST COMPLETE LINE IN AMERICA



Wyman-Gordon— specialists in the vital forgings of the internal combustion engine since its inception—is today the largest producer of crankshafts for the automotive industry and of all types of forgings for the aircraft industry. Be it crankshafts and other vital forgings for the piston type engines or turbine wheels and impellers for turbo jets—there is no substitute for Wyman-Gordon experience.

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NEWS DIGEST

Domestic

Striking AFL aircraft workers returned to Douglas Aircraft Co. and Lockheed Aircraft Corp. plants Sept. 29 following plea by President Truman to resume vital defense production. Interim contracts were signed pending negotiations.

North American Aviation reportedly is studying commercial jet transport field and is is also looking over the executive plane and feederline markets. An NAA preliminary design team is conferring with airlines and powerplant makers prior to drawing up a jet transport.

Military production figures were recently disclosed by Undersecretary of Air Roswell Gilpatric at Seattle. Gilpatric said that the B-47 Stratojet is coming off the line at the rate of better than one a day at one plant, that combined production of North American F-86s and Republic F-84s now is about 250 monthly and that Allison and General Electric are turning out a total of about 60 jet engines daily.

Summonses for low-flying have been issued five airlines and Port of New York Authority. The carriers involved are Trans-Canada Air Lines, United Air Lines, Eastern Air Lines, Northwest Airlines and American Airlines.

TWA flight engineers, scheduled to strike Sept. 29, called off the walkout following an agreement with the carrier.

Republic F-84G Thunderjet fighter-bombers have gone into combat in Korea.

R. E. Lynch has been transferred from Allison division, General Motors, to become manager of the recently formed Aeroproducts-Allison division. Max Monroe, formerly Aeroproducts general manager before the consolidation (AVIATION WEEK Sept. 22, p. 18), has been designated for special assignments.

Allison Turboliner, powered by two Allison T38 turboprop engines, has been undergoing noise-level tests at Langley Laboratory, Va.

First Boeing TB-50H K-bombing-navigation system trainer has been delivered to USAF Air Training Command. Planes will be used in training triple-threat crewmen who will function as navigator-radarman-bombardiers.

CAB Chairman Donald Nyrop has made a personal flight operations and management survey of local service airlines including Central, Pioneer and Frontier.

Leonard W. Ashwell has been named deputy chief of CAA's Air Carrier Safety division, succeeding F. A. Allen, who has been transferred to Burbank, Calif., as supervising agent. Since early 1952 Ashwell has been chief of the Scheduled Operations Branch of the division. He joined CAA in 1939.

Bendix Aviation Corp. has received an order from Swiss Air Lines for latest type VHF radio navigation and communication equipment for 26 planes. Swissair's newer and larger planes will also get Bendix Omni-Mag equipment.

Personal and executive plane shipments (one-to-ten-place craft) by five companies during August totaled 322 units valued at $2,837,000.

Col. Charles A. Brown, chief of information services for Military Air Transport Service, has been transferred to the Office of the Secretary of the Air Force in the Pentagon. His successor is Lt. Col. Bernard E. Peters.

FIVE-YEAR CONTRACT, clearing way for Pan American Airways to resume international service to Guatemala, is signed by Minister of Communications Col. Carlos Sandoval while PAA representative J. H. Wilson, Jr., watches. The agreement paves the way for PAA to negotiate with its Guatemalan ground crew employes who have been on strike since July 21. PAA previously operated into the country on a day-to-day basis.

Oct. 1 marked tenth anniversary of the first flight of a U.S. jet plane, the Bell XP-59A Airacomet, powered by two General Electric I-A centrifugal-flow turbojets.

Capt. Walter J. Shaffer, Eastern Air Lines, retired after nearly 25 years with the carrier and predecessor companies. He has covered some 2 million air miles without "scratching" a plane. His flying record dates back to 1915.

Financial

United Aircraft Products, Inc., New York, showed a net profit of $153,070 for the nine months ended Aug. 31 compared with a loss of $10,893 for the similar period last year. Firm's backlog exceeds $5 million.

Electrol, Inc., Kingston, N. Y., has declared a ten-cent quarterly dividend on common stock payable Oct. 31 to holders of record Oct. 15.

Consolidated Vultee Aircraft Corp., San Diego, reports $6,480,921 net income for the nine months ended Aug. 31, compared with a net profit of $5,922,941 for the same period last year. Convair's backlog is over $1 billion.

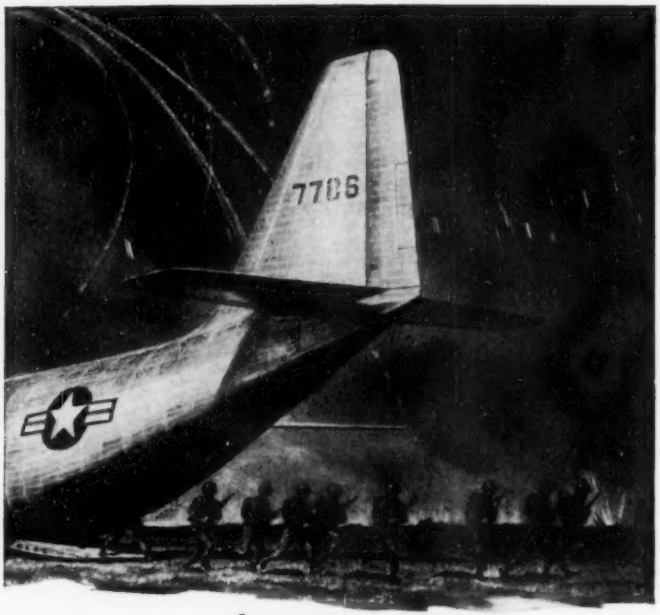
International

Gordon R. McGregor, president of Trans-Canada Air Lines, has been elected president of the International Air Transport Assn., and will take office at the next general IATA meeting in Montreal in the fall of 1953.

Canadian government has placed $119,000 in contracts for aviation equipment and parts during the last two weeks of August.

Vickers Viscount turboprop-powered transport has completed a four-day tour of German cities. Observers see the tour as a move to influence sales of Viscounts to Germany's proposed air line.

Fokker F. 27 is a proposed jet transport powered by two Rolls-Royce Dart turboprops and seating 28 passengers. It's designed for a 31,900-lb. takeoff weight. Configuration is high-wing, with single-rudder tail. A freight version is also on the boards, to carry 8,246 lb. of cargo.



Touchdown and 90!

"Here is the answer..." said a distinguished military leader as he witnessed Chase Assault Transports deliver troops, vehicles and weapons to forward combat areas ***by landing in unprepared fields.***

But this answer was not found by modifying existing planes; such attempts failed miserably. Chase planes are designed especially to provide the answer. They represent a noble accomplishment by the Air Force-Army-Chase team—an accomplishment which replaces, as the primary means of delivery, the less reliable, more costly, more hazardous techniques which were developed for interim use.

Delivery of troops is fast, safe with Chase planes. It's touchdown and ***Go!***

Chase AIRCRAFT CO., Inc.
WEST TRENTON, NEW JERSEY
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AVIATION CALENDAR

Oct. 7-8—Aircraft Electrical Society ninth annual display meeting, Pan Pacific Auditorium, Los Angeles.

Oct. 9-10—Airport management operations conference, Oklahoma University.

Oct. 9-11—International Northwest Aviation Council convention, Great Falls, Mont.

Oct. 11-18—Fourth Annual All-Texas Air Tour; information available from Texas Aeronautics Commission, Austin.

Oct. 14-15—Fifth annual Airport Development and Operation Conference, Hotel Onondaga, Syracuse, N. Y.

Oct. 19-24—American Welding Society national fall meeting, Bellevue-Stratford Hotel, Philadelphia.

Oct. 25-Nov. 2—International aviation and travel exposition, Navy Pier, Chicago.

Oct. 26—Los Angeles International Airport Air Fair and Open House, Los Angeles.

Oct. 28-30—Transport Aircraft Hydraulics System Conference, sponsored by Vickers, Inc., Hotel Park Sheraton, Detroit.

Oct. 28-30—AIEE Air Transport Committee annual meeting, Commodore Perry Hotel, Toledo.

Oct. 29-31—AIEE conference on machine tools, Ten Eyck Hotel, Albany, N. Y.

Nov. 6-7—National fuels and lubricants meeting, Society of Automotive Engineers, The Mayo, Tulsa, Okla.

Nov. 7—IRE symposium on microwave circuitry, Western Union Auditorium, New York.

Nov. 8—Annual Midwestern Tool Engineering conference, University of Illinois, Urbana, Ill.

Nov. 11-12—Piper distributors' annual meeting, Lock Haven, Pa.

Nov. 13-15—Acoustical Society of America symposium on aircraft noise, San Diego, Calif. (For details, write ASA, 57 E. 55 St., New York 22.)

Nov. 17-20—National Aviation Trades Assn. annual convention, Hollywood-Roosevelt Hotel, Los Angeles.

Dec. 2—Symposium on light-metal heavy forgings and extrusions for aircraft, SAE, ASME, IAS and AIME.

Dec. 2-5—Aviation Distributors and Manufacturers Assn. tenth annual meeting, The Kenilworth, Miami Beach.

Dec. 10-12—Joint AIEE-IRE-ACM conference on electronic computers, Park Sheraton Hotel, New York.

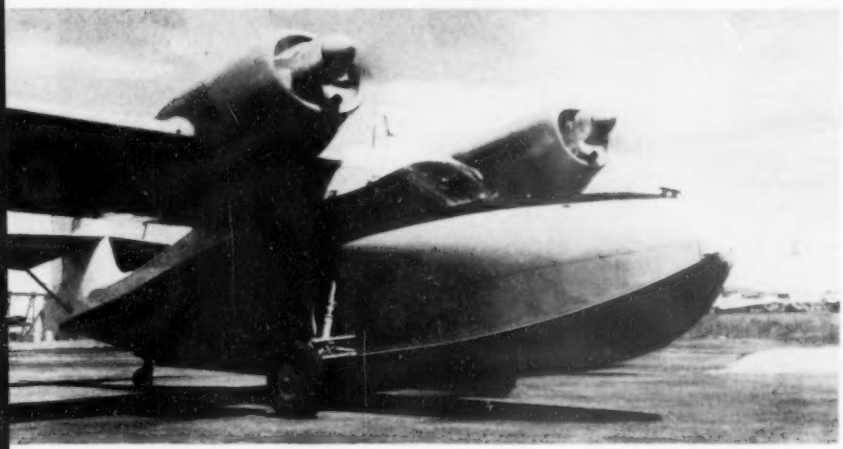
Dec. 17—Wright Bros. lecture to be presented by the IAS at 3 p.m., U. S. Chamber of Commerce auditorium, Washington, D. C.

PICTURE CREDITS

7—McGraw-Hill World News; 9—(top) Charles E. Brown; (center) Levy-Shipp; (bottom) James H. Stevens; 16—Ryan Aeronautical Co.; 17—Fairey Aviation; 18—(bottom) Pratt & Whitney Aircraft; 29—Firestone News Service; 54—North American Aviation; 69—Hawaiian Airlines.

BUSINESS END OF DH 110—Second prototype of the de Havilland all-weather two-place fighter in its jet black warpaint. This view highlights the asymmetrical positioning of the pilot's cockpit, with the radar operator located to right of pilot within the fuselage.

New Developments in Aviation



WIDGEON MODERNIZED—This (left) Grumman Widgeon executive plane differs from standard models in that it is powered with 260-hp. flat Lycomings in place of Ranger engines normally fitted. Work was done by Lockheed Aircraft Service, Burbank. The modification boosts the Widgeon's cruise speed to 160 mph. Superior Oil Co., Calif., handled the project and received the first modified.

JET LIGHTPLANE—The Italian Aero-Caproni F-5 (below) is of plywood construction. Powerplant is a 330-lb.-thrust Turbomeca Palas slung under the fuselage. F-5's gross weight is 1,655 lb., span is 25 ft. 9 in. Top speed is said to be 242 mph.

for maximum performance

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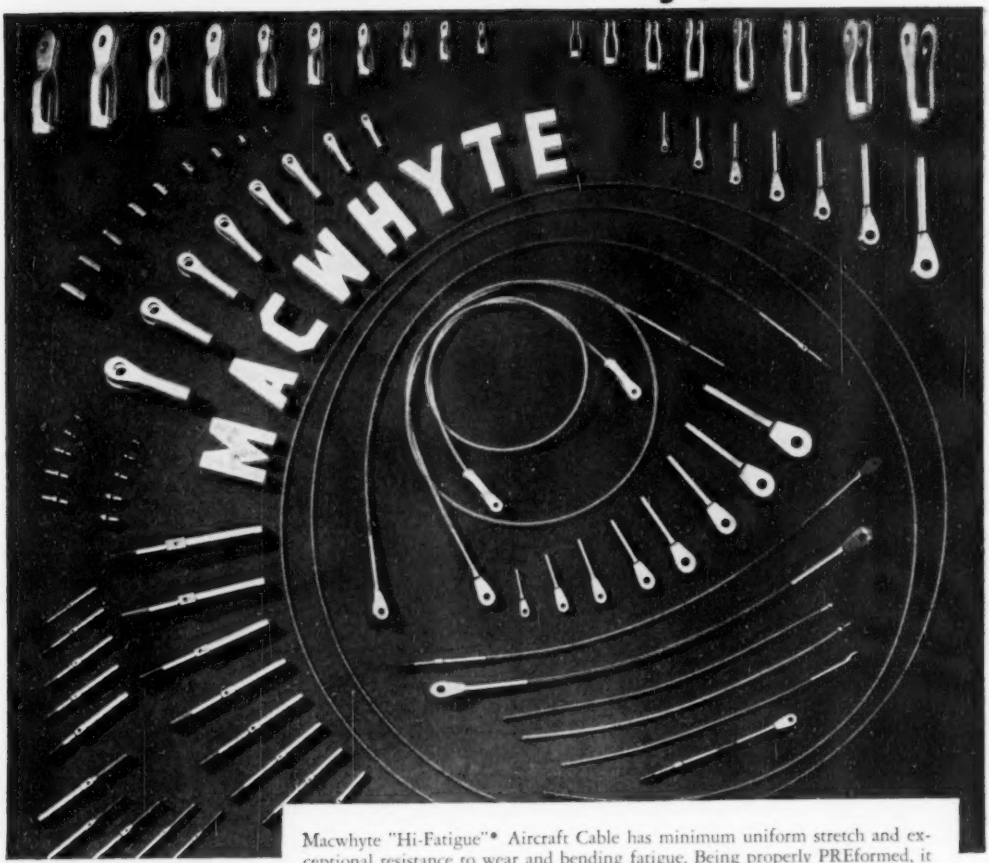

Macwhyte "Hi-Fatigue"* Aircraft Cable has minimum uniform stretch and exceptional resistance to wear and bending fatigue. Being properly PREformed, it lays dead with no tendency to twist or curl which provides better cable assemblies at lower cost.

You can order Macwhyte "Hi-Fatigue"* Aircraft Cable in reel lots, specified lengths, or assemblies. Macwhyte "Safe-Lock" and "Socket-type" terminals are supplied loose or attached to cable.

Macwhyte Aircraft Catalog A-2 is available on request.

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1018A

WHO'S WHERE

In the Front Office

Capt. A. C. Olney, USN (Ret.), has joined Temco Aircraft Corp., Dallas, Tex., as special assistant to the president, where he will handle assignments such as organization of a service organization for the McDonnell F3H Demon fighter, which Temco will build under license. Olney was BuAer representative in Dallas for three years before retiring to join the firm. **J. T. Butler** has been named chief tool engineer at Temco.

Charles T. Zaoral, formerly with Bendix Aviation Corp., has joined New York Air Brake Co. as vice president in charge of operations and as a director. **Lewis K. Sillcox**, previously executive vice president, has been made vice chairman of the board and **Robert G. Hess** has been named manager of the Air Brake's main division at Watertown, N. Y.

A. Dale Herman has been appointed vice president-general manager of Marman Products Co., Inc., makers of clamps, straps and couplings, of Inglewood, Calif.

Raymond G. Rech has been made a director, vice president-production and treasurer of Arens Controls, Inc., Evanston, Ill. He joined the firm in 1951.

Lionel B. Hakes has been appointed vice president-sales for Pierce Governor Co., Anderson, Ind., maker of fuels distributors and controls for jet engines as well as products for other industries.

Changes

Jack Zook, with Cessna Aircraft Co., Wichita, Kans., since 1941, has been designated assistant sales manager, administrative, and **Frank Martin** has been made sales manager, sales, both filling the vacancy created by recent resignation of **Don Flower. Alex Petroff** has been made director of research for the firm. He was formerly with Martin, Northrop and Howard Hughes.

John L. Hill has been made manager of Lockheed Aircraft Corp.'s Washington, D. C., office and **Charles G. Vogeley** has been named manager of the company's Dayton, Ohio, office.

W. W. Rutledge has been appointed to the newly created post of operations manager for Boeing Airplane Co., Wichita, Kans. **T. C. Pitts** is the new factory manager and **Ernie Ochel** has been promoted to factory general superintendent at Wichita. **A. W. Schupp**, factory manager has resigned to enter business with a group of partners as president and general manager of Paramount Products, Inc. The new firm will handle aircraft subcontract work in Peabody, Kans.

Dr. Urner Liddel has joined the central office staff of Bendix Aviation Corp., Detroit, Mich., as director of product development.

Harlan K. Perrill has been made manager, Engine division, Pacific Airmotive Corp., Burbank, Calif. He succeeds **L. B. Littrell**, promoted to general manager, aircraft operations.

INDUSTRY OBSERVER

► New Air Force designation for guided missiles is expected to replace interim designations. For example, the Hughes Falcon has had an interim designation of F-98 as a pilotless interceptor. As it is introduced into service use, however, it and other missiles probably will be redesignated as GAR (guided aircraft rocket) following the terminology used for other aircraft rocket weapons such as HVAR (high velocity aircraft rocket) etc.

► **Pre-production North American FJ-2 Fury carrier jet fighters which recently passed their qualification tests on the Midway were closer to standard Air Force F-86E planes than was generally known. The first two FJ-2s did not have wing-folding mechanism, although this is a standard carrier fighter requirement. Production FJ-2s, however, will incorporate wing folding, just outboard of the shackles to which the external fuel tanks are attached.**

► Not widely known is the fact that the new sweptwing Grumman F9F-6 Cougars are powered with the new 7,250-lb.-thrust version of the Pratt & Whitney J48. Installation of this engine and other modifications have extended the fuselage of the Cougar about two feet longer than the earlier Panthers, from which it was developed. The additional power, plus the 35-deg. wingsweep, gives the Cougar a performance right up in the same league with the FJ-2 and MiG-15 and a considerably higher Mach No. limitation than the straightwing Panther, which is limited at 0.83; Cougar is reported around Mach 1.

► **Landing speed of the new Republic F-84F sweptwing jet fighter is 5 to 10 mph. faster than for the straightwing F-84G with touchdown speeds in the 130-140 mph. range for the later version.**

► Army has No. 7 of Navy's 26 Kaman HTK helicopters at Ft. Bragg, N. C., for a 90-day service test for evaluation as a command liaison and litter evacuation copter. Model under test has a 240-hp. Lycoming engine and seats three with the aid of a jump seat behind the front seat. In addition to the primary control provided by varying the counter-rotating rotors, the HTK has fixed vertical tail fins for additional stability plus a floating horizontal tail surface which serves to increase the fore and aft CG-range by 20%.

► **Army aviation is still chafing under a cumbersome procurement arrangement which makes Army go through Air Force procurement channels even if the article to be purchased is a Navy helicopter.**

► Although there has been Army criticism of the Sikorsky YH-18 helicopter as underpowered at 200 hp., the small Sikorsky is being procured by Navy with the same powerplant under the designation HO5S-1.

► **The 400-lb. hoist on Army's Sikorsky H-19C will lift just that and no more. At Ft. Bragg Army loaded one of the hoists up a couple of pounds over the 400-lb. figure and it failed.**

► Cessna's experimental Model 308 airplane, designed to replace the de Havilland Beaver L-20 as an Army command personnel transport, probably will not go into production because of Army's enthusiasm about the twin-engine Beech L-23 which fills a similar role, with the plus factors of a twin-engine safety margin and a higher operating speed.

► **If the Convair T-29E turboprop version navigator-trainer transport loses out in USAF contracts, a twin-jet powered version of the Beech T-36 trainer may fall heir to the business.**

► Boeing Airplane Co. expects to make its new jet transport-tanker a double-decker like the Stratocruiser-Stratofreighter series. This arrangement lends itself to quick conversion from tanker to passenger or cargo transport. USAF is seeking a jet refueler capable of keeping up with its fast jet bombers in speed and altitude.

AVIATION WEEK

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De Havilland Reveals Comet 3 Details

- **New jet carrier's range is set at 3,000 mi.**
- **First production models scheduled for 1956.**

By Robert B. Hotz
and Nat McKitterick
(*By Cable to* AVIATION WEEK)

Hatfield, England—First detailed description of the new de Havilland Comet Series 3 has been given AVIATION WEEK by company officials. The Series 3 Comet will be the first British jet transport capable of trans-Atlantic operation and sharply competitive with American jet airliners now being developed by Douglas, Boeing and Lockheed.

This latest model in the Comet's evolution will gross 145,000 lb., will have a seating capacity of 60 for luxury service and 84 for high-density traffic. The Comet 3 will cruise at 500 mph., using four Rolls-Royce Avon R.A.16 axial-flow turbines delivering 9,000 lb. thrust apiece. The R.A.16 Avon is the civil version of the military R.A.14 which is rated at 10,000 lb. (AVIATION WEEK Sept. 15, p. 11) and powers the new Avro 698 delta-wing bomber and the Vickers Valiant bomber.

With maximum payload the Series 3 Comet will have a 3,000-mi. range. This includes allowances for 50-mph. headwind, 45-min. stacking and enough fuel to reach an alternate airport 200 mi. distant.

► **New Features**—Fuselage will be 110 ft. long—17 ft. longer than the Series 1 and 14 ft. more than the Series 2. The passenger cabin will be divided by a lateral bulkhead into two compartments; the forward portion being 25 ft. long and the rear section 28 ft. The 60-passenger version will seat 28 in the forward compartment, 32 in the rear, all four abreast. Seats will have 40-deg. pitch. The 84-seater will have 39 seats forward and 45 aft, five abreast. These seats will have 36-deg. pitch.

The Series 2 wingspan and area will be retained on the Series 3, but double-slotted flaps will be incorporated into the new model to improve lift qualities at low speeds on takeoff and landing. Other improvements will include:

- Tailpipes on both inboard Avons will be angled out 15 deg. to deflect noisy jet exhaust away from passenger cabin and reduce noise level in aft portion of fuselage.
- Two permanent external fuel tanks will be fitted in the wing leading edge about halfway between each wingtip and outboard engine. The tanks will protrude well forward and be so located that there will be a minimum change in center of gravity as fuel is consumed.

De Havilland expects the Series 3 to show these gains over the Series 1: 66% increase in payload, 73% increase in relative stage length and approximately 30% lower relative unit operating cost (see accompanying table for comparative Comet data).

De Havilland is now building components for the Series 3 prototype and expects to have it in the air by the middle of 1954. This is about the time Boeing says it will have its jet transport flying and before Douglas is scheduled to get its first DC-8 jet into the air. First production versions of the new Comet series are due in 1956 with a half dozen scheduled for completion by the end of that year.

During 1957, DH expects to get Series 3 production up to 40-50 planes with rate stepped up to 70 per year in 1958.

► **No Firm Orders Yet**—British Overseas Airways Corp., pioneer Comet operator, has first option on Series 3 production, but no firm orders have yet been signed. U. S. interest is strongest on this type. De Havilland officials say that Pan American World Airways' President Juan Trippe is serious about the new Comet, but they place less significance in Eastern Air Lines' President Rickenbacker's alleged interest.

Rickenbacker originally announced he was ready to buy up to 50 Series 2 Comets if he could get them by 1955. De Havilland came up with revised production schedules and assured Rickenbacker that they could deliver this model by the end of 1955. Rickenbacker then lost interest in the Series 2 and asked for Series 3 deliveries in 1956.

The British company has given the EAL president detailed proposals on Series 3 deliveries and is awaiting his answer. (In New York, Rickenbacker said EAL officials were poring over the material they brought back and expected their evaluation would take about three months.)

Another visitor to DH in September was National Airlines' President G. T. Baker, EAL's bitter rival on the profitable New York-Miami run. Baker made no headlines during his tour, but he left observers wondering if real U. S. Comet action might not come from National in order to cut into Eastern traffic with a luxury Comet 2 service to Miami.

► **Comet Production**—Meanwhile de Havilland is completing Series 1 Comet production at Hatfield. Second Canadian Pacific Airlines' Comet 1A has rolled out, close behind is the initial Comet for French Union Aeromaritime de Transport. There are now eight Comets on the assembly line with Comet 1 major components being assembled. Series 2 tooling is underway. There will be a slight pause in deliveries as lines change over to the Series 2.

De Havilland now has completed ten Comets including two prototype 1s and one prototype 2. A total of 21 Series 1 Comets are scheduled to be built, including 19 for various airlines and the Royal Canadian Air Force. Total Comet orders including deliveries already made stand at 56. A group order

Comet Characteristics

	Series 1	Series 2	Series 3
Gross weight, lb.	110,000	120,000	145,000
Passengers	36-44	44	60-84
Powerplants	DH Ghost	Rolls-Royce R.A.3 Avon	Rolls-Royce R.A.16 Avon
Thrust, lb., ea.	5,000*	6,500-7,000	9,000
Range, mi., full payload**	1,730	2,600	3,000
Cruising speed, mph.	465	470	500
Relative payload***	1	1.27	1.66
Relative stage length***	1	1.5	1.73
Relative unit operating cost***	1	0.78	0.67

* 5,500 lb. thrust with water injection.
** With 50-mph. headwind, 200 mi. to alternate airport plus 45-min. stacking.
*** Ratios using Comet 1 as base with value of 1.

for 10-12 additional 2s is in final negotiation.

On the Series 2, de Havilland is abandoning the fairings for its Sprite assisted-takeoff rocket motors. The company is showing no interest in either afterburners or water injection for the Rolls-Royce Avon installation. The Avons used on the Series 2 have been derated to 6,500 lb. thrust from the military model's rating of 7,500 lb.

If special operations show a need for more takeoff power, de Havilland will incorporate a scheme for moving the Avon's governors forward and thus pull up to 7,000 lb. thrust from them.

Production schedules for the Series 2 class call for output of two monthly during 1953-1954, stepping up to one-a-week when Short Bros. & Harland Ltd., gets its Belfast, Ireland, plant going on Comet 2. Short is now tooling up. De Havilland officials emphasize that Comet production plans are based on current orders. The company is reluctant to issue any further Comet production licenses since it has ample plant capacity available at Hatfield and Chester, the latter being the largest airframe plant operating in England. Deliveries of Comet 2s to Rickenbacker were based on a definite plan for expansion of Hatfield facilities, not just talk.

▶ **Sales Prospects**—De Havilland anticipates continued moderate sales of Series 2 Comets primarily to airlines having route stage requirements of 1,000 to 2,000 miles and who face acute re-equipment problems in 1955.

The most intense competition for the big world jet transport market is anticipated in 1957—when 60 big international fleets face major equipment purchasing problems. DH then will also have to compete with both U. S. and other British manufacturers who expect to have jet airliners ready for inspection, production and sale then. De Havilland feels it is off to a successful lead in the jet transport field and years of experience with earlier Comets will enable it to get Series 3s into production and on the market ahead of rival manufacturers.

AF Orders C-130 Into Production

Lockheed to build turboprop transport at Marietta; prototype still is months away from first flight.

By Alexander McSurely

Turbine-propellers and cargo transports last week figured in a crystallization of new USAF production plans which pushed the four-engine Lockheed C-130 cargo transport into the spotlight.

The Air Force ordered the turboprop-powered C-130 into volume production at the big Lockheed Marietta (Ga.) plant, although the prototype XC-130 planes now being constructed at Burbank are still months away from first flight stage.

Meanwhile, reliable Pentagon sources indicate that the production order for the XC-130 probably will mean a cancelation of production for a proposed four-engine version of the Fairchild C-119 Packet because it is too near the XC-130 design.

The first U. S. turbine-powered land-based transport design (not a conversion) to be ordered into production will be powered with four Allison T38 turboprop engines; production versions are expected to be rated at 3,750 hp. each, making a total of 15,000 hp. for the airplane.

▶ **T-29 Diversion**—The announcement came close after the USAF had canceled the program for a turboprop-powered Convair T-29 twin-engine navigation trainer. It was reported that USAF's Air Training Command had decided not to meet the development cost involved in the T-29E program; however, there was some discussion still going on about possibility of a contract for a single T-29E turboprop plane.

The T38 powerplants which had been scheduled for the T-29E probably will be diverted to production of the C-130, it was indicated, since no cancelation for the powerplants has been ordered.

Two prototype XC-130s are being assembled at Burbank, where the mockup of the airplane has been shown to the Air Force and approved.

The XC-130, designated by Lockheed as the L-206 model, is a high-wing airplane with a capacious fat-bellied fuselage; large aft cargo door opens under an upswept tail. Cargo floor is designed for truckbed level loading, 45 in. from the runway. An integral loading ramp is provided. Engine nacelles are faired into the lower wing surface. A smooth upper wing surface follows recent NACA design practices for turboprop nacelle installation.

▶ **Specifications**—The airplane was winner in a USAF design competition with four other companies (AVIATION WEEK July 9, 1951, p. 16). It called for the following specified requirements: capability of carrying a 25,000-lb. payload 2,500 mi. nonstop; takeoff over 50-ft. obstacle with full load with Rato in 3,000 ft.; land in 3,500 ft. using brakes only; have a treadway capable of supporting a 13,000-lb. single axle load; have a cruising speed of not less than 250 knots. Winning Lockheed proposal called for a design gross weight of 109,000 lb.

Observers pointed out that these were minimum requirements and that in some respects the C-130, as the winning design, may be expected to exceed these minimums appreciably. For example, it is probable that the airplane will cruise at a considerably higher speed than the 250 knots specified.

With cancelation of the T-29E, chances for a commercial turboprop version of the structurally similar Convair 340 twin-engine airliner appeared somewhat less bright. Some airlines had been hoping some of the develop-

JET ENGINE SHORTAGE GROUNDS SABRES

A considerable number of North American F-86D all-weather fighters are shown parked at the company's Los Angeles International Airport facility, most of them awaiting GE J47 jet engines, although some also need radar gear. More than 100 planes were grounded when this exclusive telephoto picture was snapped. At one time there were over 150 grounded planes on the field.

ment cost of such a plane could be absorbed in the military navigation-trainer version. However, with the Allison Turbo-Liner, a flying testbed for the Allison T38 engines developed from a Convair 240 cargo airframe, building up considerable time in the air as the first U. S. turbine-powered transport, it is too early to write off the turboprop Convair 340.

▶ **Large-Scale Program**—Assignment of the Lockheed C-130 production to the huge government-owned Marietta plant, where Bell Aircraft built B-29 bombers in World War II, could be taken as an indication that a large production program is contemplated.

It is understood that the first production contract included very substantial provision for tooling and jigs and fixtures, another indication that large-scale production is programmed by Air Force.

Lockheed now has approximately 11,000 workers at Marietta in its licensee program to build Boeing B-47 six-jet medium bombers. Lockheed recently received a follow-on contract for the B-47s and presumably will continue this production assignment along with the C-130 program. There has been no indication of a phaseout of the B-47s at a later date for larger production of the C-130s, although this is a possibility.

Other turboprop transport plans of the military services include the Navy's big Convair R3Y flying boat transport powered with four Allison T40 engines, the Douglas YC-124B transport powered with four Pratt & Whitney T34 engines, and the Navy Lockheed Super Constellation R7V-2 also powered with the T34.

Two other turboprop military planes now flying are the North American XA2J and Douglas XA2D turboprop Navy attack bombers both powered with Allison T40s.

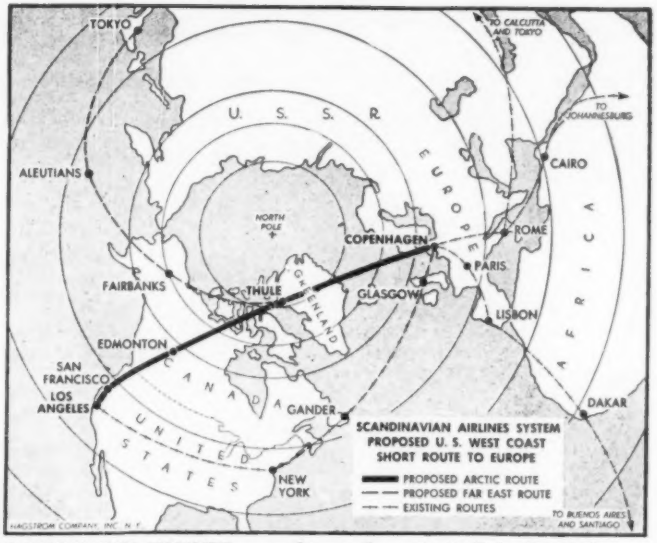
CAB Sets Causes In PanAm Crash

Causes of the water landing and loss of 52 of 69 aboard the Pan American DC-4 off San Juan Apr. 11, according to CAB investigation report, were:

• **Inadequate maintenance supervision** by the San Juan and Miami offices having knowledge of the unairworthy condition of the No. 3 engine of this plane.

• **Questionable piloting technique** by pilot Capt. J. C. Burn, who failed to gain proper flying speed to maintain altitude with two failing engines, CAB says.

• **Inadequate ditching equipment** and procedures. Company policy calls for stowing all rafts in one compartment—the relatively inaccessible position behind the cockpit.



SCANDINAVIAN AIRLINES' proposed trans-polar route via Thule, Greenland.

SAS Polar Plans Spur U.S. Action

The Scandinavian Airlines move to open a West Coast-Europe service via the North Pole may galvanize Civil Aeronautics Board into scheduling a a "trans-polar investigation" case to consider applications of U. S. carriers.

At least two U. S. airlines will soon ask CAB for routes to compete with Scandinavian plans for polar flights, Washington observers predict.

Scandinavian Airlines Systems (SAS) startled the airline industry last week by announcing that it will make a preview flight from Los Angeles to Copenhagen next month and will start commercial trans-polar operation as soon as diplomatic details are settled. SAS boasts it will give "overnight" service from the West Coast to Europe.

The Arctic-Great Circle route would shorten the Europe-U. S. West Coast air distance by about 2,000 mi.; it would shorten the Europe-Orient distance even more.

▶ **To Use Thule**—SAS plans to stop at Thule, the Air Force B-36 base in northern Greenland.

Pan American already is half-way set for a similar West Coast-Europe route over the top, but lacks one detail in its CAB-Presidential certificate. Although PanAm has Greenland, Scandinavian and European points on its trans-Atlantic certificate it needs amendment of that certificate to add West Coast cities.

That would clear the way for a direct route from western U. S. to Europe over the Arctic.

Alaska Airlines has filed a CAB application for certification over the "Arctic regions"—from Fairbanks, Alaska, to Oslo, London and Paris. Alaska Airlines made this application a year ago but CAB has not yet set a prehearing conference date on it.

▶ **U. S. Interest**—Operation of a West Coast-Europe route would have to be heavily subsidized, most observers agree. The SAS operation will be a "loss leader proposition," a PanAm spokesman says, but the national defense interest may make the proposition worth while.

A TWA official says his company has no routes that would benefit from use of an Arctic base. TWA's interest is only academic now, he says, but it may become intense if PanAm applies for such a route.

Northwest Airlines' Seattle-Orient schedule follows the Great Circle route. Lacking any certification to European or west Asian cities, NWA would have no need of a route via northern Greenland.

So Pan American and perhaps Alaska Airlines are the two most-interested U. S. lines, directly.

The State Department expects some big foreign airlines to follow the SAS lead in asking for trans-polar permits. British Overseas Airways and Air France with their jet transport plans may seek to get into the act.

▶ **Bilateral Agreements**—Even though most trans-Atlantic operators may see no use for such a route now, they may

want to join in bilateral air treaty negotiations with the U. S. soon so they may be prepared to use it in the jet or turboprop era. The U. S. already has bilateral treaty agreements with the Scandinavian countries, allowing West Coast operation by airlines of the U. S., Denmark, Norway and Sweden.

All SAS must get from State Department is a modification to the "annex" to these bilateral agreements—amending the detailed route description. The tricky part will be getting Air Force permission to make a fuel stop at Thule, Greenland.

▶**Scandinavian Plans**—SAS also plans to extend its routes into a "world system" from Europe via Thule to the Canadian and U. S. west coasts and from Alaska to Tokyo. "With our present Far East route from Europe to Tokyo through southeast Asia connecting this leg, we shall be the first truly 'round-the-world airline," SAS President Tore H. Nilert said in making public his polar route plans.

SAS has already confirmed diplomatic and technical arrangements for its exploratory trips this year, including Air Force permission to use the B-36 base at Thule.

The two DC-6B flights will be from Los Angeles to Copenhagen via Edmonton, Canada, and Thule, Greenland. The first DC-6B delivery flight on the route is scheduled for Nov. 15.

Scandinavian negotiations with the U. S. and Canada for scheduled commercial service via Thule may be complicated initially because the Air Force base was built under a NATO pact. But since it's Danish territory, and the Scandinavians, including the Danes, are the ones wanting to use the base for airline fueling, observers say Air Force-Scandinavian horse-trading might go through despite the existence of security problems.

▶**PanAm View**—A PanAm spokesman said it will be some weeks before PanAm conducts a high-level conference on the question of whether to apply for a trans-polar route. But indications are that the company will apply for a route similar to the one SAS plans to fly.

But PanAm doubts that such an operation can be commercially profitable in the foreseeable future. PanAm's New York office is doing $37 million worth of sales now, a spokesman told AVIATION WEEK; the projected trans-polar operation would be small in comparison, he said, so it's mainly up to the Defense Department. Defense may figure that the Air Force already has so much military flying going on in the Arctic that airline subsidy to gain more experience in cold-weather operation may be unnecessary. PAA Public Relations Director Willis Player noted that the Scandinavian's Arctic flight experience is small compared with that of the U. S., so a subsidized airline operation there will be relatively more valuable to them than to the U. S.

However, Player also notes that there is merit in use of airlines on Military Air Transport Service routes. If Thule, Greenland, were British territory, BOAC would probably fly there instead of the RAF.

Arctic operations are still tricky, Player says, but routine operation there is definitely practical now.

Pan American is ideally set up for trans-polar operation, Player says. PanAm has its Alaska division, Scandinavian routes, Iceland operation and Greenland certificate. Also, the company does not have a truly 'round-the-world system because it cannot fly revenue flights across the U. S. The trans-polar route can much simplify globe-girdling flights.

▶**TWA Viewpoint**—The trans-polar airline proposals of SAS are just "interesting" to TWA now, according to a company official. TWA has no routes now that could benefit from such operation.

Frankfurt is TWA's closest city to Scandinavia, and polar operation from the western U. S. to Frankfurt couldn't be justified commercially or even experimentally, the company believes.

TWA's position is one of watchful waiting.

▶**Alaska Airlines Position**—Welsch Pogue, Washington attorney for Alaska Airlines (also former CAB chairman), told AVIATION WEEK that Alaska Airlines' new president, Nelson David, is taking a fresh view of all Alaska Airlines policies. The old management submitted the Fairbanks-Europe application to CAB, and perhaps the new management may withdraw it, or else press it. It is too early to tell, Pogue says.

The Alaska Airlines attorney said he had not given thought to the trans-polar question yet. But off-hand he believed it would all depend on whether the Defense Department believes such an operation would be worth subsidizing for the benefit of military experience.

▶**Air Force View**—Air Force Public Information Office says it cannot find that AF has taken any official position on the SAS request for permission to use Thule AF Base and conduct scheduled operation over that route. Unofficially, an AF spokesman stated that the most obvious problem might be security wraps on Strategic Air Command equipment at Thule, which might be visible to all passengers aboard a foreign airline. Secretary Thomas K. Finletter was unavailable for comment, but had been quoted as saying that Thule would eventually be as important to commercial flying as it is now to the military.

Politics and AF

- **Air power drops back as issue in campaign.**
- **Eisenhower urges cut in cost, not in strength.**

By Katherine Johnsen

Air power seems to be losing out as a campaign issue.

Democrats don't want to highlight the Truman Administration's role in holding the Air Force down to 48 groups back in 1949 and 1950, vetoing an expansion to 70 groups.

And the Republican candidate, Gen. Dwight Eisenhower, apparently isn't going to push the matter.

Before the political conventions, the general spoke up for emphasis on air power in the national defense, proudly pointing to his sponsorship of a 70-group air arm as Army Chief of Staff in 1946. His leading competitor for the Republican nomination, Sen. Robert Taft, was verbally thrashing the Administration for failure to recognize air power, and Eisenhower was keeping pace with Taft.

▶**Soft Pedal**—But Eisenhower's first major address on national defense at Baltimore as the Republican Party's nominee, indicates a tendency to soft pedal air power.

A possible reason: In 1949 and 1950, as adviser to former Secretary of Defense Louis Johnson and as president of Columbia University, Eisenhower supported the Administration's plan to hold USAF to 48 groups. In the spring of 1950, just three months before the Korean outbreak, he testified to Senate Appropriations Committeemen: "I still consider that in the world situation, 48 well-equipped regular groups and some dozen in the National Guard would be probably a safe minimum."

Before the Republican convention, Taft men issued releases castigating the general for this testimony. Little of it reached public print. Democrats, assuredly, won't challenge the general for being on the same side of the fence as the Administration.

The most notable disclosure of the general's defense address is that he squarely puts a sound economy of low taxes and balanced budgets first: "The foundation of military strength is economic strength. A bankrupt America is more the Soviet goal than an America conquered on the field of battle."

▶**Trimming the Fat**—But he does not concede that lowered expenditures for defense means less defense striking power.

His approach appears similar to that

of former Defense Secretary Johnson: the same defense for less money. Johnson called it "building muscle and cutting fat."

Eisenhower declared: "The big spending is, of course, the $60 billion we pay for national security. Here is where the largest savings can be made. And these savings must be made without reduction of defensive power. That is exactly what I am proposing."

To accomplish this the general recommended:

• **A new commission.** Creation of a commission "of the most capable civilians in our land to restudy the operations of our Department of Defense. These men and women should, of course, be specifically qualified for their tasks. They should, I believe, be drawn from both parties, so that all matters of national security may clearly be placed beyond party politics."

• **An expanded council.** The National Security Council, the nation's top policy agency, composed of cabinet officers and headed by the vice president, should be enlarged to include top-caliber civilians "of the highest capacity, integrity and dedication to public service." The present membership of the council is "already burdened by the duties of their own offices. The council, as presently constituted, is more of a shadow agency than a really effective policy maker."

Eisenhower listed these possibilities for achieving savings in the Defense program:

• **Careful weapons evaluation.** "We must press for a weapons program that is realistic. We cannot pretend to do everything in every field all of the time. Any attempt to do so would waste as much skill as money. For this reason, our judgment in weapon development must be sure and sound and related to tactical needs. To do this the professional fighting man requires the advice and knowledge of both industry and labor.

"Whenever a new weapon comes from the laboratories, all services—sometimes understandably—demand the right to use it. Stranger than this is the almost inevitable demand of each service to do the research, development and production work on new weapons. Each believes that it can do the work better. In this matter prompt adjudication among the services is mandatory—otherwise you will find all three engaged in spending public money for a single need."

• **Simplicity of design.** "To save money and increase efficiency we must emphasize simplicity in design. Back in 1948 when I submitted my final report as Chief of Staff, I wrote as follows: 'A program for research and design of new equipment is an obvious necessity, but simplicity should be stressed more than has been our practice in the past. We Americans are inclined to confuse the biggest, most complicated and most durable with the best. Whereas, in war, the simple and expendable weapon may, in the light of time and production of facilities, be the most satisfactory'." I could write the same today.

"Modern war teaches one sure lesson, that today's best weapon is out of date tomorrow. The progress of science warns against putting too much confidence into today's best weapon for soon it may be obsolete."

• **More civilian judgment.** "More civilian personnel and direction must be called into the weapons production program. In this field again it is impossible for the professional to make the exclusive judgment. The interplay of labor, tax, production and economic factors requires a pooling of expert civilian advice."

Eisenhower attacked the "bungling involved in creation of our Morocco air bases" as an example of the stop-and-start planning which he criticized:

"To build bases of this type economically takes two to three years. What did we do? We waited until 1951, six months after the war in Korea broke out. After all this foot dragging, the Administration then insisted on a 'crash program'—get it done fast whatever the cost. The result is this: We got two bases for the cost of five."

And the Republican nominee quoted the report of Sen. Lyndon Johnson's Preparedness Subcommittee on the buildup of U.S. Air Forces, as "painstaking documentation of our failures" when it summarized its criticism of the buildup as "a saga of bad programming, neglected warnings, lack of coordination, abuse, misuse and disuse of power."

RYAN JET TARGET

Artist's conception of the new "near-Sonic" Ryan Q-2, a tiny jet-propelled target drone. The project is a joint Air Force-Navy-Army development. Although no details have been released on the Q-2's production status, the company is known to have received orders for a service test quantity.

Higher Load Factor Gives BOAC Profit

London—The government-owned British Overseas Airways Corp. has concluded the first profitable fiscal year in its history, showing a gain of approximately $770,000 on operations concluded March 31.

The previous fiscal year BOAC registered a net loss of $12.9 million.

The carrier credits two developments in particular for this dramatic switch from red to black ink in writing its accounts:

• Load factor jumped from 59.7% to 65.5%. Also, despite a decrease in its plane fleet, BOAC's capacity went up 20%. Prior to introduction of the DH Comet jet transport, its fleet consisted of 72 planes of five different types: 22 Argonauts, 10 Stratocruisers, 10 Constellations, 20 Hermes and, on freight service, 10 Yorks. In 1948 the roster carried 137 planes of nine different types.

• Thanks to the new aircraft and economies in operation, break-even load factor was reduced from 75% to 65%. BOAC has reduced its maintenance bases from eight to two major ones. And it has cut its staff by approximately one-third since 1948. Four years ago, BOAC's theoretical break-even load factor was an impossible 115%.

▶ **Revenue Gains**—Seat revenues were up to $54.5 million ($15.2 million more than fiscal 1951) because 50,000 more passengers were flown. Passenger miles were up to some 2 billion. Total load-ton-mileage increased 30% to approximately 123 million. Revenue from all sources climbed 46.5% over the previous fiscal year to $94.5 million.

Despite an all-time high total operating cost of $90 million, British Overseas Airways Corp. reduced operating cost per capacity ton-mile from 46 cents to 45.2 cents.

All of the carrier's profits came out of Middle and Far East and African operations—the trans-Atlantic services to North and South America were still showing losses—though smaller ones than two years ago. About one-third of total revenues were derived from the trans-Atlantic operations, where net losses totaled $569,000. Services to the Middle and Far East brought in 41% of the total revenue, with African routes bringing in a little over 25%.

▶ **Future Optimistic**—Looking ahead, BOAC Chairman Sir Miles Thomas was cautiously optimistic. He sees increasing revenues from tourist traffic.

Comet operations are showing a small profit—net gain on the jet transport through the end of August was $16,800, according to the carrier.

But Sir Miles warns of steadily rising costs. Since the loss of aviation gas facilities at Abadan, Iran, Britain and BOAC have had to depend heavily on U. S. supplies. Sir Miles also plugged for another mail rate increase. An increase last year netted the carrier $3.65 million, enough to put the airline in the black.—**N. McK.**

Several Production Changes Expected

Several aircraft scheduling changes recommended in the Campbell Report to the Aircraft Production Board are likely to show up later even though current Aircraft and Engine Schedules No. 18 do not provide for them in the immediate future, Washington observers forecast last week.

These sources pointed out that Defense Department and industry opposition which crystallized against the Campbell Report was based more on the early timing of changes than on the changes themselves. Many of the model changes asked for in the report had their original source in some military recommendations. But apprehension of what a wholesale switch to new models would do to current aircraft production was responsible for the objections to the Campbell plan.

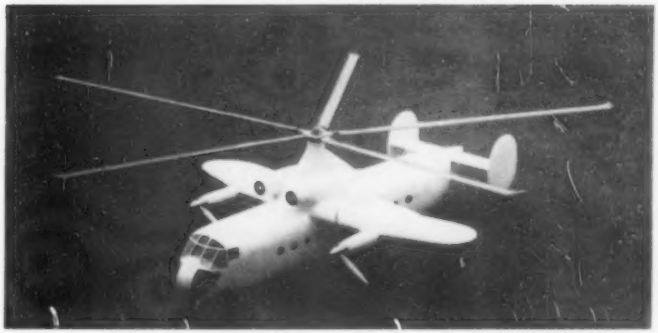
Two changes informed sources say are projected call for pushing the four-engine B-47C into earlier production, succeeding the six-jet Boeing B-47B, and for phasing out Northrop F-89 interceptor about a year and a half from now, at the end of the F-89D production, because of duplication of mission of the still later F-89F with another upcoming airplane.

► **Mockup Board**—This probable phase-out, it is understood, has no relation to the temporary grounding of F-89C interceptors following recent Scorpion accidents at Detroit and Newburgh, N. Y. F-89A and F-89B interceptors are still flying.

One other positive accomplishment of the Campbell Report already made is a change in the cumbersome procedure of Service Aircraft Mockup Boards, which had come up for criticism. Number of the board membership has been cut from a maximum of 60 to 12 or less.

And the boards are now instructed to make at-the-plant decisions after mockup inspection meetings, instead of delaying the procedure for several weeks.

After his brief but spectacular career as acting chairman of the DPA Aircraft Production Board, William L. Campbell is planning to leave this job and his other government assignment as DPA Deputy Administrator for Production to return to his civilian job as head of the Food Machinery & Chemical Corp., San Jose, Calif. Nov. 1.



TWIN-JET FAIREY ROTODYNE (shown) is seeking to win BEA's copter competition.

Rotodyne Meets BEA Specs

Farnborough, England—First details of the Rotodyne—convertiplane proposal by Fairey Aviation Co. Ltd., Hayes, Middlesex—show it to be a strong contender for the prize of British European Airways helicopter competition.

Meeting BEA's passenger-copter specs, the Rotodyne is designed to carry 13,000 lb. useful load at a cruising speed of 175 knots, half again as fast as the current world's record for helicopters.

Fairey is building two of the craft and expects flight tests in about two years. In addition to BEA, Silver City Airways, operating the cross-Channel aerial ferry service, has shown keen interest in the project.

► **Unusual System**—The Rotodyne combines an unusual five-bladed rotor system with a unique powerplant.

Fixed high wings unload the rotor for highspeed flight, and appear to have enough area to guarantee a reasonable landing in case of structural failure of the rotor.

The unusual powerplant consists of a pair of gas turbines driving auxiliary air compressors. Air intake for the entire system is at the front of the paired nacelles on either side of the pylon mast; exhaust for the gas turbines is at the rear of those nacelles.

Air from the compressors drives the main rotor through pressure jet nozzles at the tips, or can be valved to turbine units driving the wing-mounted propellers. Note that these are not turboprop units, but simply a propeller, gearbox and power turbine section. There are no problems of mechanical drive of either rotor or props; air is routed through the system by valving.

In vertical flight, all power is absorbed in the rotor system; for cruising the larger percentage goes to the wing engines.

Rotor diameter of the Rotodyne is 80 ft., and the gross weight is 31,000 lb. Range is 350 nautical miles at the 175-knot cruising speed.—**DAA**

Railroads Testify At Nonsked Hearing

Cutrate fares charged by nonscheduled airlines may hurt the national interest through cutting into the railroad coach business, according to testimony by the Association of American Railroads.

Dr. J. H. Parmalee, AAR vice president, who introduced exhibits tending to indicate this at Civil Aeronautics Board examiners' hearings on what to do about the nonscheduled airlines' competitive impact on scheduled airlines, told AVIATION WEEK that the railroads' are not making a direct case against nonsked expansion. But, he said, the facts in his testimony indicate that nonskeds hurt railroad business, and a healthy railroad industry is vital to national defense.

► **Other Testimony**—During recent nonsked association testimony, American Airlines used cross-examination of Air Coach Transport Assn. President Amos Heacock to bolster AA's contention there may be secret control of some nonskeds. Presented the names of presidents of three carriers of the North American Airlines Group, Heacock could not identify their positions, although these three carriers are registered as members of ACTA. Heacock stated that Stanley Weiss handled the business of North American Airlines (formerly Twentieth Century) with the association.

Titanium Specs

- **Air industry takes step toward standardization.**
- **And West Coast groups hope to increase stocks.**

By William J. Coughlin

Los Angeles—The aircraft industry is drafting first specifications for titanium following two important metals committee meetings on the West Coast.

The National Aircraft Standards Metals Stocklist Subcommittee approved American Standard (ASA) thicknesses for titanium while proposals for industry specifications were placed before the American Materials Specifications Committee for titanium sheet, plate and bar stocks, but not tubing.

These specifications, drafted by producers and consumers, will replace individual mill specs now in use with AMS numbers. This standardization is expected to speed use of titanium by the aircraft industry. Government adoption is anticipated later.

▶ **Stocks in 2 Years**—"The use of titanium is expanding rapidly and the adoption of industry, and later, military specs will hurry the process," explained Glenn Aron, chief standards engineer of Northrop Aircraft and chairman of the Metals Stocklist Subcommittee. For the first time, Aron pointed out, the stocklist subcommittee is able to prepare a recommended warehouse list in advance of inventory establishment.

Titanium will be stocked in West Coast metal supply warehouses within two years as supplies increase and the cost per pound decreases.

Titanium today is so scarce and expensive that warehousing is not possible. Airframe manufacturers order directly from the mills in small quantities and demand exceeds present production.

"This is easy to understand when you realize four jet engine pods can use up 5,000 lb. of titanium," said Aron. Representatives of the four major suppliers of titanium in the United States—Titanium Metals Corporation, Rem-Cru, Mallory-Sharon and Republic Steel—took part in the discussions.

▶ **How It Works**—The metals subcommittee functions this way: By providing a place for exchange of accurate information between industry and suppliers on material wanted, it improves metal stocks by bringing them in line with industry needs. By advance planning of this type, airframe manufacturers can obtain required material in time in proper quantity and reduce the need to deviate from what is called for in production drawings. Standardization speeds up the process by knocking down variables. Differences in company requirements were thrashed out wherever possible in the two-day session.

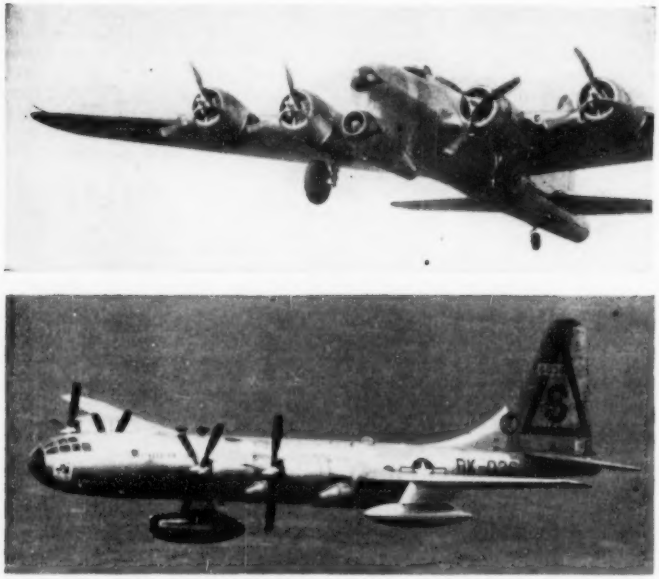
Two conclusions were obvious from the meetings:

- The industry is learning to simplify its problems by working more closely in voluntary group projects such as these committee meetings.
- The system has resulted in a great increase of the exact raw stocks needed locally.

▶ **Results**—The subcommittee took note of several important results of its work at this annual meeting:

- **The government** has approved ASA thicknesses to replace all "gage" systems in which there were different systems for each metal and sometimes different systems for the same metal in different parts of the country. The subcommittee's recommendation calls for expression of thickness in three decimals of an inch for all metals. This now will be extended to titanium.
- **Metal suppliers**, by patterning their stocks to aircraft industry requirements, have reduced inventories of little-used items and reduced shortages in most-used items.
- **Simplified list** of stocks sent to the Air Materiel Command and BuAer's Aviation Supply Office has brought a considerable number of orders to West Coast warehouses, even on material manufactured in the East.
- **West Coast** airframe manufacturers have been able to cut down considerably on their own warehousing as a result of the closer liaison with local metals supply warehouses. Aron estimated Northrop's warehouse had been reduced by more than half as a result of the subcommittee's work.
- **The nation's** best warehouses of aircraft materials now are those on the West Coast.

▶ **Long Way to Go**—That there still is a considerable distance to go in simplification and in educating the personnel concerned, was evident in the report of representatives from one of the major airframe plants in the Los Angeles area. They told of an experience in which plant inspectors rejected stainless sheet marked .037 (although it was sorely needed on the production line) because the order had been for .036. Although the acceptable mill tolerance of .004 around the nominal meant the sheet would have been acceptable from .033 to .041, the inspectors refused to accept it due to the .037 marking on a .036 order.



FLYING TESTBEDS PROVE JET ENGINES

Two different approaches in mounting jet engines on flying testbeds to accumulate engineering data are shown in these pictures. At top is Wright Aeronautical division's Boeing B-17G fitted with a J65 Sapphire under the nose; above is Pratt & Whitney's Boeing B-50A carrying a J57 slung under its belly—the latter installation is retractable into the bomb bay, the former is not. Note that the B-50 is flying on the J57's power alone, all four props of the piston engines are feathered. The B-17G has not been flown this way, though it could.

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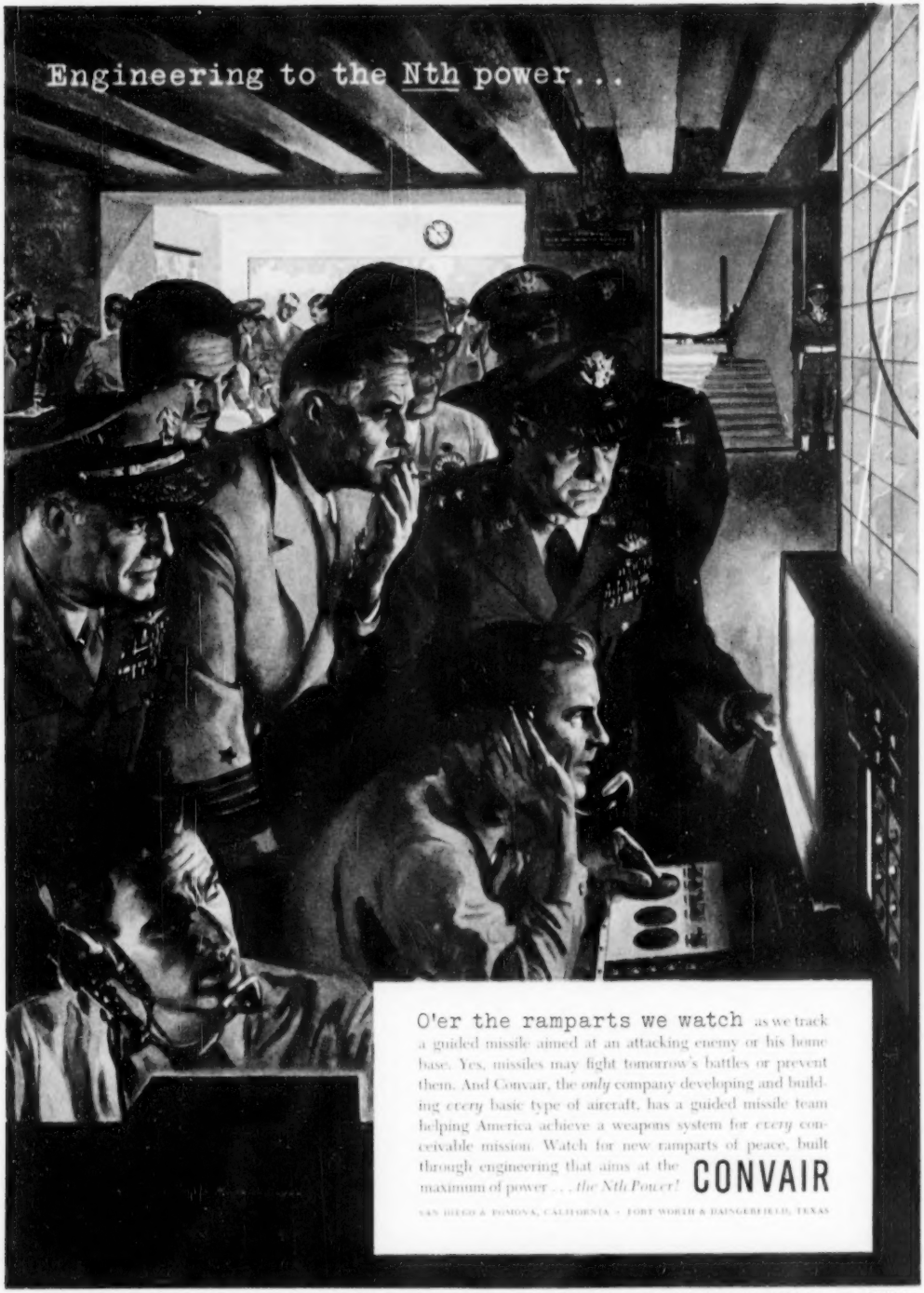
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'Pinwheel' Power Package for Missiles

- **Auxiliary unit's design saves weight, space.**
- **Rotating rocket motor is heart of device.**

By William J. Coughlin

Long Beach, Calif.—A rotating rocket motor is the energy source of a new unit developed as an auxiliary powerplant for small guided missiles.

The power package, which will turn out from 4 hp. to 20 hp. for durations up to 4 min., is a product of the research and development laboratories of Whirlajet, Inc., a local engineering firm.

Inside the unit, the torque generated by the whirling, solid-propellant rocket motor is switched around to drive generators, alternators and a closed hydraulic system.

Inventors of the "pinwheel" package are Jack H. Zillman, president and chief engineer of Whirlajet, and Harry M. Steele, Jr., also a member of the firm. The idea is not a new one, nor is the firm the first to experiment in this field. But Whirlajet believes it is closest to production with its unit.

►**Advantage** – Whirlajet believes the main advantage the rotating rocket motor holds over other types of power units for small missiles is its ability to withstand the rough operating conditions of tactical use.

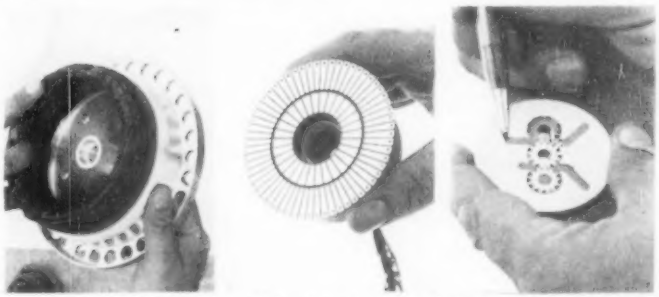
"In addition, the package saves weight over existing systems, saves space to an even greater degree, and inherently possesses simplicity, which means greater reliability and lower production costs," Zillman says.

When in production, Whirlajet will build its package right into a section of missile skin. The complete unit includes a rotary rocket motor, electrical generators and alternators, runup motor and a complete hydraulic system with reservoir, check valves, relief valves, bypass valves, accumulator and pump.

This complete power slice is fitted into the missile at final assembly, much like sliding a dime between two other dimes. The package also could include fuel pumps and air compressor equipment if desired. Size and weight will vary with missile type.

►**Propellant**—Most of Zillman's development problems centered around the propellant for the rotary motor. He worked closely with the new propellant

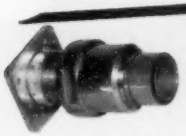
EARLY PROTOTYPE of basic "prime mover unit" held by Whirlajet president and chief engineer, Jack Zillman, indicates size, weight and configuration of the present unit (above). Power package contains solid propellant which, after ignition, exhausts through opposing ports and spins the unit.



INNARDS of Whirlajet unit include: alternator stator (left photo), being fitted into housing—power unit spins at 12,000 rpm. inside this 2,500-watt stator; d.c. generator commutator (center); hydraulic pump (right) with tolerances as fine as .0001 inch.

BASIC POWER SUPPLY components are shown in this disassembled view of Whirlajet prototype. For security reasons, it is not permitted to show parts assembled.

ALLEN AIRCRAFT for Dependability



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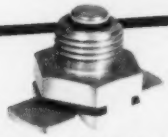

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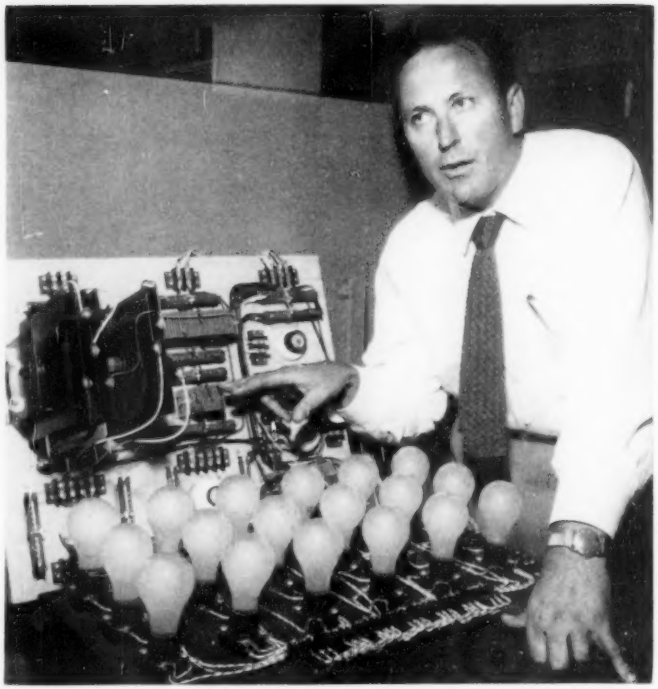


ELECTRONIC SPEED CONTROL is one of Whirlajet's projects. "Breadboard" magnetic amplifier frequency control senses changes in voltage and frequency.

division of Grand Central Aircraft and with Aerojet.

Ignition problems required a great deal of time during initial stages of development. Black powder ignition proved unreliable, especially with certain types of propellant. Since the propellant required a dwell time to ignite, the heat produced by black powder proved too instantaneous.

Whirlajet switched to electric ignition by resistance heating to set off the charge. The ignition is two-stage and takes one-tenth of a second. A copper wire is imbedded in a thin wafer of high-energy propellant which in turn ignites the low-energy propellant which fuels the rocket motor.

While black powder sometimes failed in ignition tests, there have been no ignition failures since switching to the present resistance system, Zillman states.

Another problem was that of achieving the high pressures in the closed hydraulic system, but Whirlajet believes it now has found the answer with a method Zillman prefers not to discuss.

▶ **Exhaust Drag**—Since the exhaust of the rocket motor is ported to the exterior of the missile through two ¾-in. openings, there was initially some worry over the drag effect. While the prototype package has not yet been flight tested, Zillman says aerodynamic studies have indicated drag probably will not be a problem. Mass flow from the ports will be very low in proportion to the passing flow.

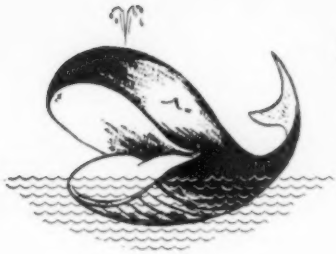
Main drawback to the Whirlajet development is this: While its operating time of up to 4 min. will cover many of the air-to-air and ground-to-air missiles now developed by this country, it will be completely unsuitable for long-range ground-to-ground missiles.

But the unit will have several advantages over battery and pressurized gas type hydraulic units designed for the same short-range purposes, Zillman believes.

▶ **Comparisons**—The Whirlajet package, which will provide a.c. power as well as d.c., is designed to operate over a wider temperature range than possible with a battery unit. Zillman considers this an important tactical edge since short-range missiles may be launched over an extremely wide temperature range.

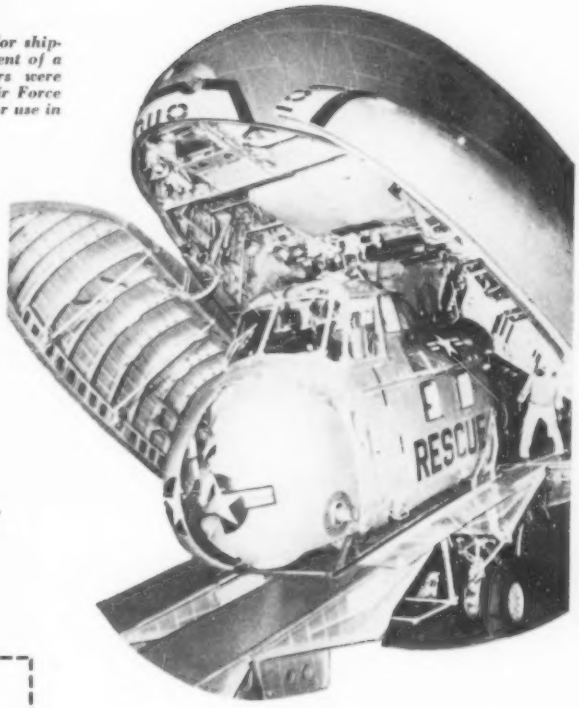
While tiny batteries cannot be stored for great lengths of time in the field and must be used shortly after they are connected to the missile, Zillman contends his unit can be stored for up to five years without ill effects.

"Tiny batteries are fine for research



here's a **WHALE** *of a story!*

This Sikorsky H-19 helicopter, stripped for shipment, is pulled into the cargo compartment of a Douglas C-124 Globemaster. Helicopters were loaded on planes recently at Westover Air Force Base, Massachusetts and flown to Korea for use in rescue work.



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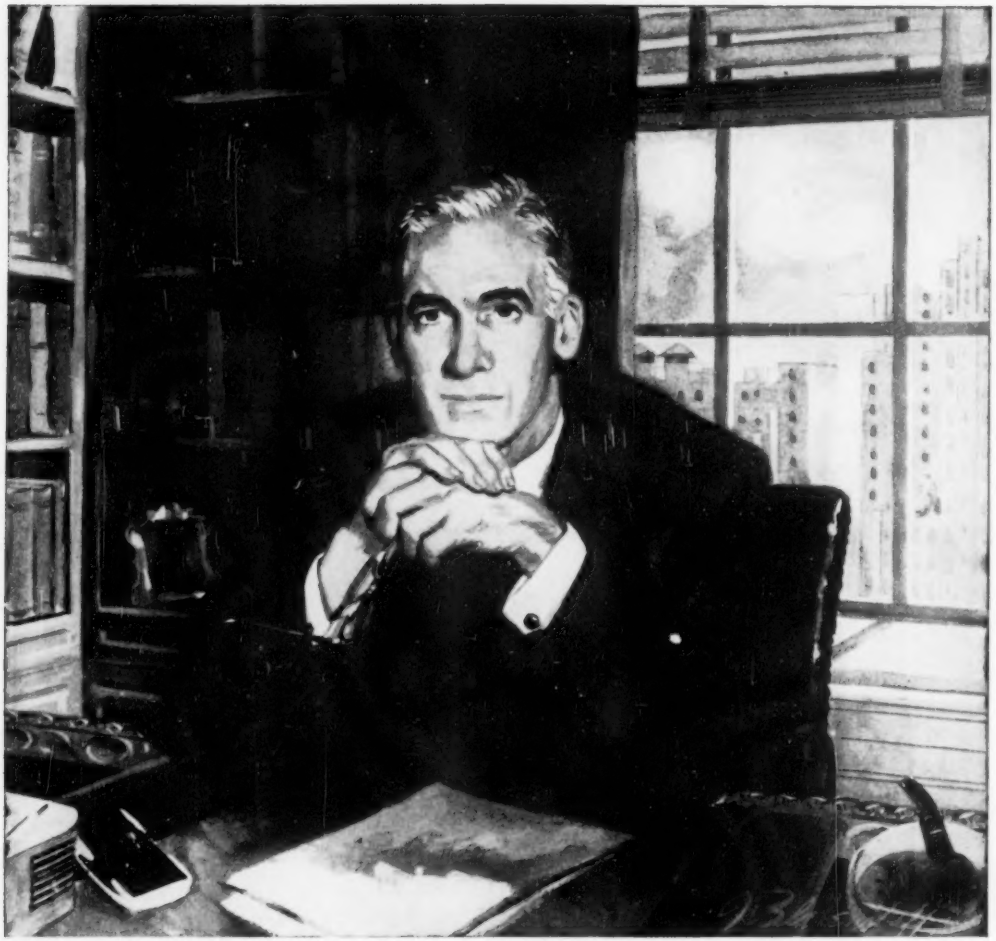

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missiles," says the Whirlajet inventor, "but not for tactical missiles."

Whirlajet claims these advantages for its product over a ram-air turbine power unit:

- **Rapid changes in air pressure** (caused by climbing through a tremendous range of altitude in a short time) will not trouble the rocket motor.
- The rocket motor is operating at full speed through a runup motor when the missile is launched. The rocket is ignited and takes over from the runup motor. Altitude has virtually no effect on rockets as the propellants contain their own oxygen.
- **Bearing problems will be minimized** since Whirlajet uses ordinary aircraft bearings while the ram-air turbine requires high-precision bearings.
- **Rocket motor comes up to speed** faster from a dead start due to constant thrust. Zillman contends that Whirlajet's simple hydraulic supply is more practical than the system which requires dry nitrogen gas pumped into an accumulator at pressures from 4,000 to 6,000 psi., a regulator which bleeds this down to 1,500 to 2,000 psi. and a diaphragm which puts pressure on the oil which operates the system.

The closed Whirlajet hydraulic system saves weight over an open system which tosses the oil overboard, thereby requiring a greater initial oil supply.

Since the Whirlajet package includes a runup motor the unit can be operated before launching without the necessity of reloading oil into the closed system—as required by a one-shot open hydraulic system.

"All these things boil down to the important fact that our product is more tactical," Zillman contends. "While the others might be fine for research purposes, they have too many tactical disadvantages. For example, the missile umbilical plug is less complicated. Only two power leads (to the runup motor) are required by our unit before launching, plus any monitoring leads that may be required. The Whirlajet package is designed for tactical use."

▶ **History**—Growth of the Whirlajet firm has been rapid. Behind Zillman is several years' work as a research engineer in the guided missile field at Hughes and Marquardt. As he worked with missiles, the young Californian found what seemed to him a universal fault: The lack of a satisfactory power package for the electrical and hydraulic systems.

After months of study he came up with his idea of a rocket-propelled power package to run the electrical and hydraulic systems.

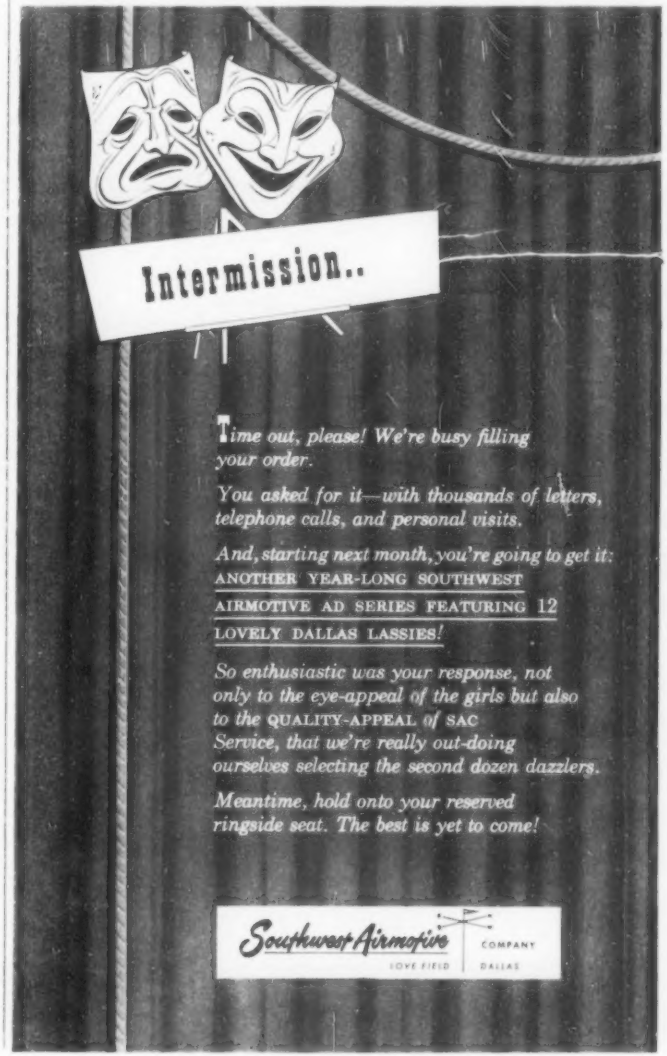
Zillman began experimenting and immediately ran into another problem when neighbors frowned on his noisy homework. He bought a four-wheel flatbed trailer, mounted a boiler-plate strongbox on it, and attached a set of recording instruments. On weekends he hitched his car to the trailer and towed it out into the desert near Palmdale, Calif. There, with the strongbox as protection against possible explosions of his apparatus, he conducted his experiments.

Zillman has had close cooperation, particularly in the electrical equipment, from Steele, Whirlajet co-inventor, who is now a consultant to the firm.

▶ **Independent**—A year ago Zillman felt far enough along to strike out on his own. He left Hughes, found financial backing and set up Whirlajet, Inc., with himself as president and chief engineer. For the first seven months, working alone, he also was the entire staff.

The staff now has grown to 25 persons—mostly engineers since the work still is in the experimental stage. Whirlajet holds research and development contracts from the Atomic Energy Commission, Bell Aircraft and Raytheon. Large production and development contracts are expected soon.

At present the staff is scattered in three shops in the Los Angeles area, using owned and rented equipment. A new Whirlajet plant of 7,200 sq. ft. on a 5-acre site on Wilmington Ave. in Long Beach is ready for occupancy and the staff soon will assemble under one roof.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Rocket Meeting Talks About Engines

Rocket powerplant research was the subject of several papers presented at American Rocket Society's recent meeting in Chicago. Authors' summaries of five of the papers follow. Other papers were summarized in AVIATION WEEK Sept. 29, p. 44.

▶ **"Problems of Development of Ramjets for Supersonic Application," by J. O. Charshafian, Wright-Aeronautical div. of Curtiss-Wright Corp.**

The ramjet is an air-consuming engine best suited for supersonic operation at Mach numbers greater than 2.0. Operating in its optimum speed range, the ramjet is the most efficient combustion engine on the basis of maximum useful energy per pound of fuel.

It is, however, not capable of static thrust since air flow in a ramjet is induced by its forward motion. This disadvantage necessitates the use of a booster for ramjet powered vehicles.

Related to this characteristic, more complex and extensive facilities are required to make possible environmental temperatures and pressures encountered by the ramjet at supersonic speeds. And it complicates the development of accessories and power-control system.

The supersonic air inlet for this engine required the most advanced type of aerodynamic research and development. The combustion system entails operation over a broader range of absolute pressures and fuel air ratios than encountered by other types of aircraft engines and thus contributes to the overall development problem. Development to date has resulted in achievement of the performance originally predicted.

The potential of the ramjet as an advanced type of aircraft powerplant cannot be over-estimated.

▶ **"The Pulsejet as a Present Day Powerplant," by Brooks T. Morris, Marquardt Aircraft Co.**

Postwar development of pulsejet engines has made powerplants of this class feasible for a wide range of subsonic aircraft applications, including helicopters. Flight test experience and new methods of flight simulation have brought principal advances.

Matching of engine performance to aircraft propulsion requirements over wide subsonic speed range has been accomplished. Valve life is no longer a major problem. Correlation of combustion performance with engine shape has been demonstrated. Several United States pulsejet engine models have undergone prototype qualifications and limited production so as to demonstrate flight performance repeatedly, particularly by means of target aircraft.

▶ **"Liquid Propellant Pressurization Systems," by Y. C. Lee, Aerojet Engineering Corp.**

A general discussion on various means of propellant-tank pressurization is given. Unique and conventional systems are analyzed and discussed. Particular emphasis is

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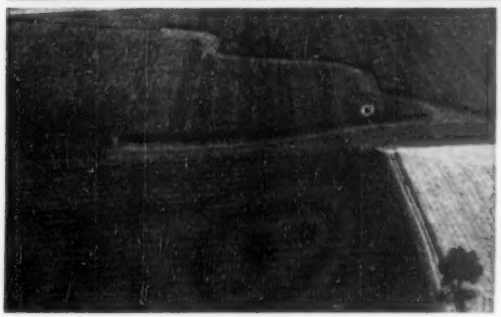

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Air view of fields of seed corn at the Thorp farms showing cross breeding to produce select hybrid types.

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given to the chemical pressurization method in which a gas generator, either liquid propellant or solid propellant, is utilized to generate combustion products for tank pressurization. Pertinent parameters associated with chemical pressurization are discussed. The problem of temperature sensitivity of solid-propellant employed to pressurize liquid-propellant tanks is analyzed. Some experimental data substantiate the analyses.

▶ **"Experimental Investigation of Performance of WFNA-JP-3 Rocket Motors at Different Combustion Pressures," by M. J. Zucrow and C. M. Beighley, Purdue University.**

The performance and heat transfer rates for 500-lb. thrust, $L^* = 100$ inches, rocket motors were determined experimentally as a function of mixture ratio at 300, 500, and 700 psia. combustion pressures. In all cases the propellants used were white fuming nitric acid (WFNA) and jet engine fuel (JP-3).

The maximum values of specific impulse were obtained at a mixture ratio of 4.5 and the values were 222, 235, and 246 for 300, 500, and 700 psia. combustion pressure respectively.

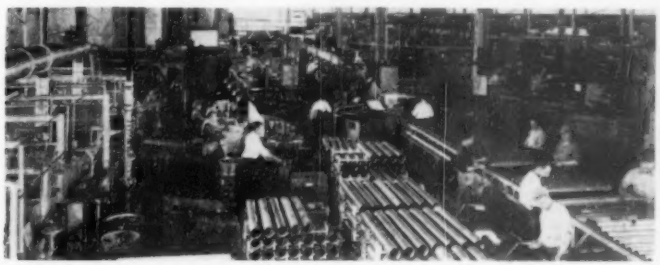
Raising the combustion pressure from 300 psia. to 700 psia. increased the overall heat transfer for the thrust cylinder from 1.3 to 2.3 Btu. per sq. in. per sec. and that for the nozzle from 2.8 to 6.0 Btu. per sq. in. per sec.

▶ **"Manned Flight at the Borders of Space," by Dr. Heinz Haber, formerly of Dept. of Space Medicine, USAF School of Medicine, Randolph AFB, Tex., now of University of California.**

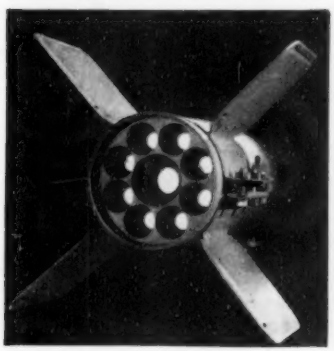
The development of modern aviation is progressing at a rapidly increasing rate. The modern aircraft propelled by a rocket engine is capable of outclimbing the denser layers of the atmosphere and carries man into the environment of space. Flights at very high altitudes are still short in duration; nevertheless, the technical means available in aviation of today make it necessary to attack the human problems peculiar to flight beyond the confines of the terrestrial atmosphere.

The elements which constitute the environment of space are drastically different from those found in the lower layers of the atmosphere. Nearer the ground, the air provides breathing oxygen; it supplies an agreeable climate; it acts as an effective filter against cosmic factors such as excessive solar radiation, cosmic rays and meteors; and, its mechanical support preserves the pilot's weight.

In order to survive in the thin strata of the atmosphere, man must be adequately protected by artificial means which must substitute for the atmosphere left behind. It will be possible to artificially replace some of the life sustaining functions of the atmosphere; however, the impact on man of other factors of the cosmic environment cannot be avoided. Such factors are the heavy primaries of cosmic radiation and prolonged periods of weightlessness. Radiation damage and possible ill effects of weightlessness must be considered as the most outstanding medical and physiological problems of space flight.



Aircraft Rockets on the Line



The "muscle" end of a hard-hitting 5-in. aircraft rocket (closeup) shows the multi-exhaust nozzles in the weapon's motor, now being mass-produced by The Firestone Tire & Rubber Co., Akron, for U. S. Navy Bureau of Ordnance. Four stabilizing fins are assembled on the end of the steel tube (combustion chamber) which will house the motor's propellant. Factory photo shows a section of Firestone's rocket motor production line for the high-precision components. After the steel tubes are machined and threaded, they are tested hydrostatically under 4,800 psi. pressure. Next, they are bonderized and painted. Final assembly includes affixing of the exhaust nozzles and fins.

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Lockheed Uses 'Ounce of Prevention'

- **Lab checks equipment as it is received.**
- **Step bars defective units from getting in planes.**

By Irving Stone

With highspeed planes emphasizing thinner wings, tighter streamlining, larger engines and more fuel, there is a distinct premium on space. This adds up to tighter fitting of equipment, so that even with accent on accessibility, the replacement of a malfunctioning unit during plane buildup or after completion can be an expensive job—not counting delay or penalties involved.

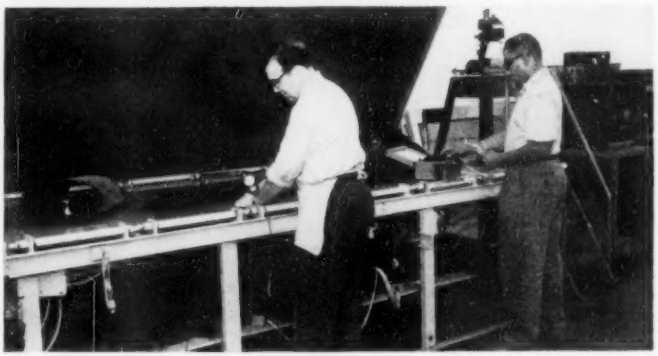
That is why the old "ounce of prevention" philosophy is getting new emphasis in Lockheed Aircraft Corp.'s production scheme. The company is taking intensive measures to minimize the element of chance that a piece of equipment won't work after it is anchored in place in the plane.

▶ **Labs Consolidated**—Lockheed's approach is through a new functional testing laboratory that brings together most of its widely separated testing facilities in one centralized activity for checking equipment under simulated operating conditions before the installation phase.

There are other service angles the lab encompasses. Because parts are checked upon receipt, it is assured that only acceptable units are placed in stores. This means a true inventory picture of usable parts for production. If stored parts weren't checked until issued to production, there could be a critical parts shortage due to a high rejection rate. Then, too, with parts stored for any length of time, with checking coming later, some vendors might refuse to accept responsibility for the defective equipment as a result of the tardy rejection.

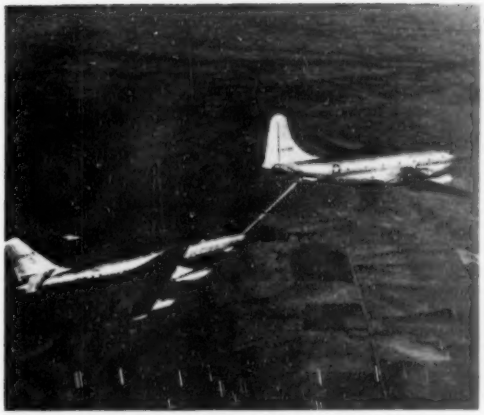
▶ **Classes Handled**—The laboratory—one of the largest installations of its kind in the industry—represents an extensive investment, but it introduces sound economy in supplementing the production scheme. Not only does it screen parts from vendors, but also Lockheed-fabricated assemblies, government-furnished equipment, parts rejected for malfunction and those

LOTS OF ROOM is provided for receiving and shipping equipment in Lockheed Aircraft Corp.'s new functional test laboratory.



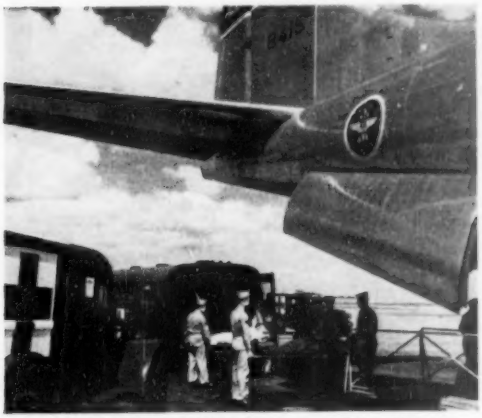
BOOT SHOP is section of the functional test lab where rubber de-icing boots are checked. F-94 Starfire boots are being tested above.

JUICE STAND is where electrical units coming into the Lockheed laboratory are checked by elaborate electronics testing section.

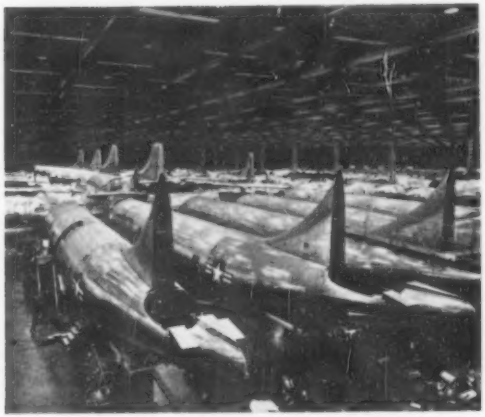


KC-97 Tanker refueling a B-47 jet bomber in flight

A transocean Stratofreighter on Azores' Lajes Airport



C-97 flying hospital brings home wounded from Korea



Boeing's Stratofreighter production line in Renton plant

Four air carriers for the price of one

When your Air Force adds a Boeing C-97 Stratofreighter to its fleet, it gets in effect four different air carriers. This is the most versatile aircraft now in service. It can be converted in hours into a cargo carrier, a personnel transport, a flying hospital, or a tanker for in-flight refueling.

This unique versatility makes the C-97 a bargain aircraft. With Stratofreighters, fewer airplanes are needed to perform a number of diversified jobs. Concentration on one type means further savings in parts supply and crew training.

Stratofreighters are in service with the Strategic Air Command and the Military Air Transport Service. They have become, like their sister ships the commercial Stratocruisers, major transocean carriers.

The C-97's versatility and dependability are a result of Boeing's vast experience with multi-engine aircraft, both military and commercial. Today, through the sensational B-47 medium and B-52 heavy jet bombers, Boeing has gained more experience with multi-engine jets than any other company. When America turns to jet transports, this Boeing background of experience will be directed to establishing U. S. leadership in this field.

For the Air Force, Boeing is building the **B-47 Stratojet, B-50 Superfortress, C-97 Stratofreighter, KC-97 Tanker** and the **B-52 Stratofortress;** and for the world's leading airlines, Boeing has built fleets of twin-deck Stratocruisers.

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Cramped by small space and big requirements? Take a look at 8 pygmy resistors that make room for reliability anywhere. All were developed by IRC to fill specific wants. Many meet JAN or MIL Specifications. And all are available on short delivery cycles.

Smallest Fixed Composition Resistor in the World

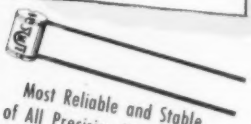
Type BTS—½ watt. Meets JAN-R-11 Specifications, tough G Characteristic. Filament-type resistance element, extra-Bakelite-sealed against moisture and humidity. Body less than ½" long—3/32" in diameter. Anchored, non-loosening leads. Low operating temperature and high power dissipation. Resistance change less than 1% under 5-hour vibration test. Easily meets rigorous requirements of avionic equipment. Send for full details in Data Bulletin B-1.

Small, Deposited Carbon PRECISTOR

Type DCC—½, 1 and 2 watts—Combines accuracy and economy with high stability, low voltage coefficient, low capacitive and inductive reactance in high frequency applications. Resistance body size 9/16" x 3/32". Excellent for circuits where carbon compositions are unsuitable and wire wound precisions too large or expensive. Designed to meet Signal Corps Specification MIL-R-10509A. Full technical information in Data Bulletin B-7.

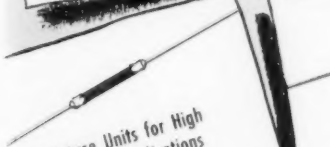
New Boron-Carbon PRECISTOR—Ultimate in Stable Non-Wire Wounds

Type BOC—Boron-Carbon PRECISTOR meets the most critical circuitry needs—conforms to all requirements of MIL-R-10509A. Voltage coefficient—less than 20 parts per million per volt. Load life extraordinary; on a 500-hour test at ambient temperature of 40°C. resistance change will not exceed 2%. ½ watt. Resistance body 9/16" x 3/32". Send for complete details. Data Bulletin B-6.



Most Reliable and Stable of All Precision Wire Wounds

Type WW—Far surpasses MIL-R-93A Specifications. Severe cycling and 100-hour load tests produce no change in resistance. Tests also show high mechanical strength, freedom from shorting, resistance to high humidity. New winding forms hold more wire—give higher resistance. New winding technique ends shorted turns or winding strains. New insulation assures long trouble-free life. New terminations are rugged, strain-free. Best for avionic equipment—by unbiased test. Complete data in Data Bulletin D-3.



Miniature Units for High Frequency Applications

Type MPM—Active resistance section only 1/8" long—body 5/16" x .100". Thin resistance film permanently bonded to solid steatite ceramic rods. Phenolic varnish insulation. Excellent electrical characteristics—low voltage and temperature coefficients of resistance. Power rating—¼ watt at 40°C. ambient. Ask for full details in Data Bulletin F-1.

High Ohmic, High Voltage Resistors with Axial Leads

Type MVX—Body 2" long—¼" diameter. For high voltage applications where high resistance and power are needed. Helical turns of resistance coating provide long, effective resistance path. Low specific-resistance materials assure exceptional stability—even in very high values. Send for complete information in Data Bulletin G-2.

Flat Insulated Wire Wound—Most Adaptable Ever

Type MW—fixed or adjustable. Meets widest variety of design requirements. Low initial and mounting costs. Flexibility in providing taps at low cost. Offers many opportunities for saving space. Unlike most wire wounds, can be operated at full "on-plate" rating without exceeding rated temperature rise of 100°C. Practically impervious to elements. Mounting bracket transfers heat to chassis. Takes overloads of 150% indefinitely with little effect. Write for complete information in Data Bulletin B-2.

For High Wattage Dissipation—Singly or Ganged

Type FRW—Corresponds to JAN-RW-Types. Depth—½"—Lengths from 2¼". Higher space-power ratio than standard tubular wire wounds. Exceptional mechanical strength; withstands severe vibration. Can be mounted vertically or horizontally. Choice of 2 coatings—to withstand extreme heat or unusually humid atmospheres. Fixed or adjustable. Get particulars in Data Bulletin C-1.

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which have exceeded storage limits. Some of the tests performed could not be accomplished after an item had been installed in an airplane.

Details of this functional test lab, located adjacent to Lockheed's freight yard off-loading point, were compiled for AVIATION WEEK by John Whitlow, Lockheed's administrative coordinator for receiving and shipping in the functional section division, and Paul Koger, manager of functional test inspection.

To encompass inspection of different types of equipment, functional test is divided into four sections—high flow fuel test, electrical and instrument, oxygen and pneumatic, and hydraulic sections.

▶**Fuel Test Lab**—This is the most recent addition in the functional check setup. All high flow single-point fueling and defueling equipment is inspected here. Safetying the entire 18 × 39-ft. test area is a floor drain trench, a few feet from the walls, fitted with a carbon dioxide fire extinguishing system operated both automatically and manually. Near each of the two exit doors is a decontaminating shower which may be operated by pushing a lever with any part of the body.

Lab supply unit is an underground tank holding, as the testing fluid, 10,000 gal. of Stoddard Solvent to Federal spec. P.S. 661. Directly beneath the fluid tank is a 40-hp. motor to drive a seven-stage turbine pump that will deliver 600 gpm. at 60 psi. to each test cell in the lab. The pump is located in a fluid well with intake port 8½ ft. below the tank bottom, to give a minimum head pressure of 2.9 psi.

▶**High Flow Piping**—The pump pushes fluid through a 6-in. line to a decontaminator to remove water and filter the fluid to 5 microns. From the decontaminator, the fluid is piped to the lab's 8-in. feed line located on the walls 11 ft. above the floor. Each test cell hooks into this line with a 3-in. pipe housing a desurger just upstream of a control valve affording progressive flows up to the maximum 600 gpm.

An 8-in. line takes the fluid back to the storage tank. To avoid line disruption—as from effects of earthquake—feedlines and the return line are fitted with flexible joints.

Although the lab is now fitted with four test cells, each designed to accommodate a different type of equipment, future requirements will be able to be fitted in three open facilities now installed.

In addition to coping with test requirements, Lockheed sees this high flow fuel facility as playing an important role in the future development of single-point high-pressure systems.

▶**Oxygen and Pneumatics**—These actually are separate, adjacent test facilities, primarily to prevent oxygen equipment from becoming contaminated with grease or other foreign matter. Gas used for oxygen test is nitrogen from 2,000-psi. bottles and conforming to specifications for breathing-oxygen dryness. Tests include those for leakage and operation.

The pneumatic test section is taking

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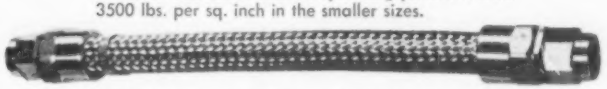
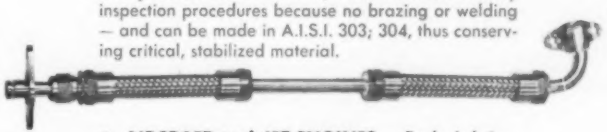
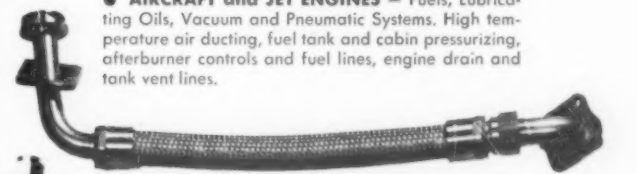
● **AVICA** Stainless Steel Flexible Hoses can be supplied in all sizes from ¾" to 4-inches Internal Diameter for conveying SAFELY and RELIABLY fluids and gasses at temperatures from MINUS 375° Fahr. to PLUS 1375° Fahr. and at operating pressures from 3500 lbs. per sq. inch in the smaller sizes.



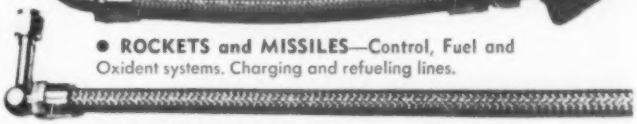
● **AVICA** Couplings (Patents Pending) are ***mechanically attached*** to the hose, therefore need no x-ray inspection procedures because no brazing or welding — and can be made in A.I.S.I. 303; 304, thus conserving critical, stabilized material.



● **AIRCRAFT and JET ENGINES** — Fuels, Lubricating Oils, Vacuum and Pneumatic Systems. High temperature air ducting, fuel tank and cabin pressurizing, afterburner controls and fuel lines, engine drain and tank vent lines.



● **ROCKETS and MISSILES**—Control, Fuel and Oxident systems. Charging and refueling lines.



● **ELECTRONICS** — Screened ignition harness and shielding for Jet Engines. Electrical wiring and thermocouple conduits and ducting in high temperatures.

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an added significance because of the growing research in the use of compressed air for aircraft accessory operation.

The test stand is a package unit in a welded steel cabinet. A sliding steel door can be closed to segregate the entire area. All controls can be operated with the door closed, and a 20-in.-square, 2-in.-thick, bulletproof window affords the inspector the protection he needs while observing tests.

There are three separately regulated test outlets for providing equipment with pressure ranges up to 200, 2,000 and 6,000 psi. The highest pressure is obtained by boosting nitrogen from a 2,000-psi. bottle with an air booster. Two flowmeters check leakage in the .01-24 cu. ft. min. and 2-28 cu. in./min. ranges.

▶ **Hydraulic Section**—This branch of functional test houses 28 check benches. Not only is hydraulic system equipment accommodated, but provisions also are made for testing components of engine oil, water, anti- and de-icing and fuel systems.

Hydraulic system test benches vary from simple installations for such things as leakage checks, to complicated stands which include all facilities found in the smaller and special test units. These complete stands will handle all types of hydraulic pumps, actuating cylinders, valves, hoses, etc.

Hydraulic oil pressure is furnished by a constant speed, variable-flow pump driven by a 40-hp. electric motor. It is possible to maintain an oil flow of 20 gpm. at 3,000 psi. or reduced flow at 5,000 psi. In addition to the electrically driven pump, there is a hand pump for static tests. For easy access, valves for opening or closing any port on the panel are located above the port unless otherwise noted. If the port is placed on the bench front, the valve is directly below. Pressure shut-off valves have red handles.

Hydraulic pump test section utilizes a hydraulic motor driven by pressure from the main pump. Hydraulic pumps are hooked to the motor through an adapter coupling. A pressure reservoir is provided for testing pumps which operate in a pressurized hydraulic system.

There are special fixtures for checking length of travel, leakage and chatter of special cylinders for such installations as landing gear and shimmy dampers.

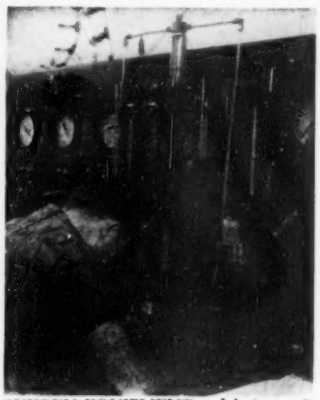
To avoid flushing and to protect equipment in storage after test, a rust inhibitor oil (Spec. MIL-O-6083A) is used as a testing fluid at most benches.

▶ **Other System Parts**—Fuel system component test benches are fitted with equipment similar to the hydraulic benches. Here are tested various valves —selector, check, solenoid, rate of flow —and pumps. A special fixture is used to test submerged fuel booster pumps under installation conditions.

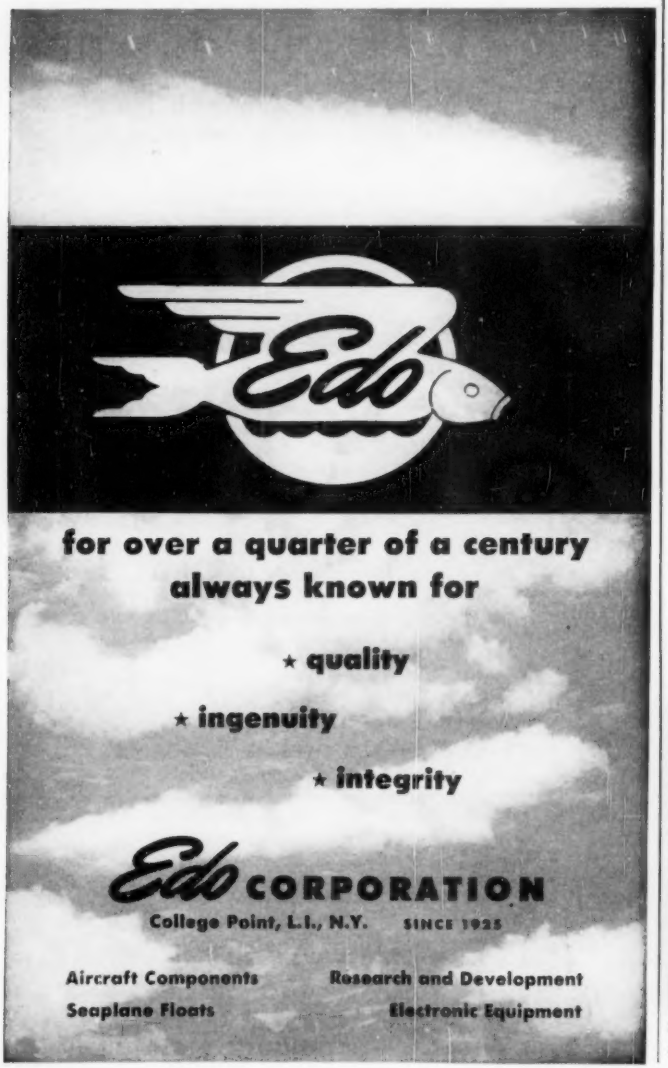
Stoddard Solvent is the testing fluid and parts are flushed with the rust inhibitor oil before storing.

Benches using engine oil as the fluid medium primarily are employed to test valves in hydraulic propeller control systems, for transfer pumps and thermostat controls.

Equipment used in fluid anti-icing systems for carburetors, props and



OXYGEN EQUIPMENT and instruments are tested in moisture-proof room.



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GCA Radar Landing Systems—Military and Civil—have been produced by Gilfillan (1942-1952) than by all other companies combined.

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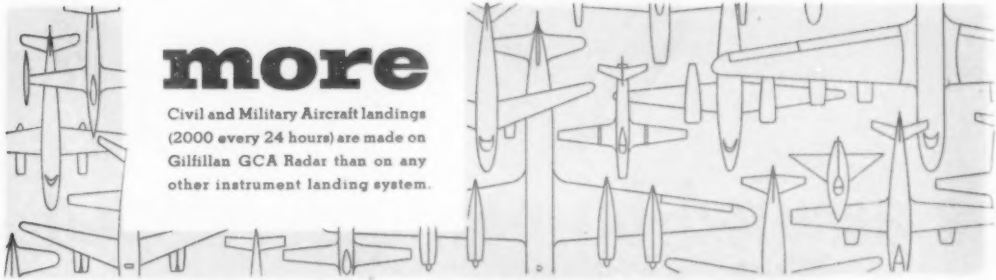
Nations, Air Forces and Civil Airports are equipped with Gilfillan GCA. Gilfillan GCA is the only standard equipment adopted by 24 nations of the free world.



more

Civil and Military Aircraft landings (2000 every 24 hours) are made on Gilfillan GCA Radar than on any other instrument landing system.

more

Military and Civil GCA equipment is being produced today by Gilfillan and more will be produced during 1953 and 1954 by Gilfillan than by all other companies combined.

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windshields are checked at separate benches using alcohol as the medium. Pressurized wash-water system components are checked at still another bench.

To keep testing fluids off the floor, all benches are set in metal pans.

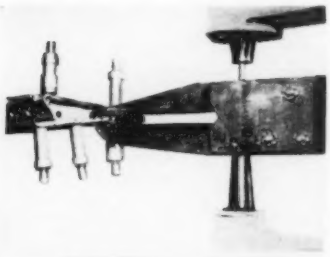
Each gage and instrument is checked every two months by gage repair. A set of master gages is always available for checking the accuracy of any working gage.

► **Electrical, Instrument**—Test spots for this section include about 120 panels, many equipped for multiple use, some for specialized jobs. To avoid overhead wiring, power is brought in underground. There are extra conduits for future expansion.

The setup is tailored to test the wide run of electrical and electronic equipment and nearly all types of aircraft instruments, simulating operational requirements both on the ground and in the air. To simulate a plane's power supply, a portable panel has been designed for each type of generating system, such as the simple d.c. installation using a voltage regulator, reverse current relay and generator, or a more complete system with over-voltage protector and contactors. There are panels for several a.c. systems with regulators, exciters and alternators.

For a simulated shipload, load banks are used—one that will handle 600 amp. at 30v. d.c., and a three-phase bank capable of handling up to 30kva. Two remote controlled vari-drives are used to drive the generators and alternators, one rated at 15 hp., the other at 50 hp. A new 70-hp. vari-drive is being installed to meet the larger capacity systems.

There are special stands to test for



FOR CLOSE QUARTERS

Small alligator-jaw attachment squeezes rivets in hard-to-reach spots of trim tabs. Operation previously required rivet gun and bucking bar, often resulted in buckling of the part. Used as an accessory on Chicago Pneumatic riveters at Temco Aircraft Corp., Dallas, the device consists of two tapered jaws mounted together by a pivot. It fits into holes in the plunger and anvil of the riveter yoke for the top and bottom sets. Rubber cushion between the jaws holds them apart until the machine is energized, shooting the rivet.

These American Electric Miniatures do BIG jobs!

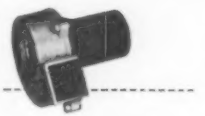
Cooling and Ventilating

CENTRIFUGAL BLOWERS

400 cycle, 60 cycle, or variable frequency types (320 to 1000 cps.)

Substantially flat output over full frequency range on variable frequency models with minimum watts loss.

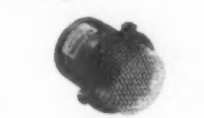
Blower scrolls of latest design are molded of fibre-glass reinforced plaskon: practically unbreakable, highly resistant to impact, deformation, heat and cold. Blower unit unusually small in size and weight for compact installations. Generally used when working against pressure heads ranging up to 1.2" water. Single or double end blowers, Clockwise or Counterclockwise rotation. *Output range: 24 to 200 cfm. Made in sizes: Numbers 1½, 2, 2½, 3.*



AXIAL FLOW FANS

400 cycle operation

In its smallest size this compact, light weight unit is equipped with a 2" fan protected with 18" mesh 2¼" O.D. screen shroud. Other larger sizes special. Air stream is conical. Recommended for use at 0 static pressure where semi-directed air flow is required. Motor diameter 1.45". Rotation: Clockwise or Counterclockwise. *Output: 30 cfm.*



PROPELLER FANS—400 cycle operation

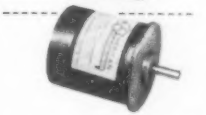
Built for limited space applications requiring maximum air movement widely dispersed.

Operates at 0 static pressure in ambient temperatures from −65° to +65° C. Made in 2, 3, 4 and 5½" fan diameters. *Output range: 33 to 680 cfm.*

Motivating Cams, Timing Devices, Antennas, Clutches, Optical Equipment, etc.

MINIATURE INDUCTION MOTORS

400 cycle, 60 cycle, single and poly phase, 2 to 8 pole. Frame diameters: 1.45", 1.75", 2", 2½" & 3-5/16". *Output torque range: ½ in. oz. to 50 in. oz.*



SYNCHRONOUS MOTORS

400 cycle, 60 cycle, hysteresis and reluctance types. Single and poly phase: 2, 4 and 6 pole. Frame diameters: 1.45", 1.75", 2", 2½", 3-5/16". *Output torque range: .01 in. oz. to 10 in. oz.*

Both induction and synchronous motors can be supplied for intermittent or continuous duty, with standard or high temperature insulation. Drive and synchronous motors: any standard shape.

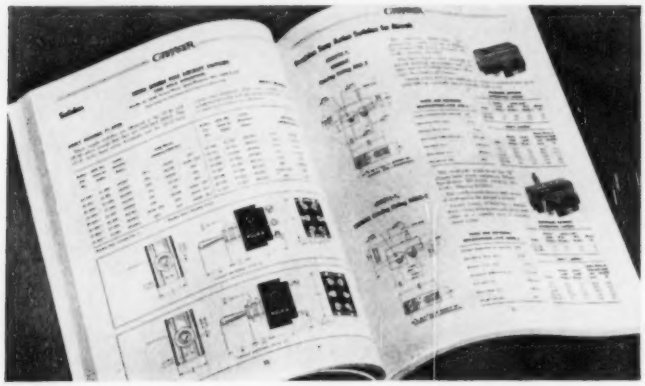
Manufacturers also of INSTRUMENTS, SERVO-MOTORS AND SYNCHROS, HIGH FREQUENCY POWER SUPPLIES *(Inductor—Alternator type—500 watt to 75 KVA output).*

AMERICAN ELECTRIC MOTORS TRADE MARK

4811 Telegraph Road, Los Angeles 22, California

CATALOG

For Men in Aviation Manufacturing and Maintenance



Aviation Materials — Components and Assembly Line

Published by Graybar Electric Company. 224 pages. This 8½" x 11" volume, printed on coated stock and illustrated throughout with half-tones, lists hundreds of electrical items in constant use as components and on the assembly line. Written and edited for the convenience of men in the aircraft field the book represents the most comprehensive catalog now available to this highly specialized industry. In addition to test data, illustrations and specifications of parts and materials, the book carries many reference tables of great value and convenience. Tables on wire, for example, list AN sizes, AWG sizes, number of strands, approximate bare diameter, shipping weight in pounds per thousand feet, maximum over-all diameter and nominal copper weight in pounds per thousand feet. More than 200 separate items are listed in an alphabetical, easy-to-find index.

IF YOU USE ANY OF THESE ITEMS

- ☐ Wires and cables
- ☐ Tubing and sleeving
- ☐ Relays
- ☐ Signaling devices
- ☐ Connectors
- ☐ Resistors
- ☐ Switches
- ☐ Plugs and jacks
- ☐ Terminal blocks

YOU NEED THIS CATALOG

Graybar distributes a complete line of electrical supplies, component parts and other materials used in aviation manufacture and maintenance. In addition, Graybar maintains a nation wide warehousing system that helps assure you of on-schedule deliveries of all the items you require. For your personal copy of this outstanding catalog, write: *Graybar Electric Co., Inc., Executive Offices: Graybar Building, 420 Lexington Avenue, New York 17, N. Y.* 256-2510

Call Graybar first for... Graybar Everything Electrical

IN OVER 100 PRINCIPAL CITIES

insulation breakdown in deicer equipment for latest type aircraft. A circuit breaker test stand capable of checking out 1,500 units per eight-hour day is also installed. A special dark room is for inspection of edge-lighted panels.

Pressure for instrument panels is available up to 600 psi. from a nitrogen source. Low pressure panels are supplied from factory air. Vacuum source draws on two large pumps and a smaller unit for use with bell jar and manometer.

USAF CONTRACTS

Following is a list of recent USAF contracts announced by Air Materiel Command:

HMB Electronics, Inc., 36 Grove St., New Canaan, Conn., radar beacon & data, 73 ea., $76,038.

Jackson Electrical Ins. Co., 18 S. Patterson Blvd., Dayton, tester, 344 ea., $157,552.

James Mfg. Co., Fort Atkinson, Wis., laboratory darkrooms, spare parts, data, 26 ea., $786,000.

Jam Handy Organization, Inc., 2821 E. Grand Blvd., Detroit, production of a motion picture, $94,998.

Jayval Mfg. Co., 1615 California St., Denver, parachute, 5,000 ea., $775,000.

J. O. Mfg. Co., 8442 Otis St., South Gate, Calif., pin, 50 ea.; spacer, 100 ea.; spring, 100 ea.; solenoid, 250 ea.; release assembly, 1,000 ea.; arm tripping, 20 ea.; body, 20 ea.; bracket, 60 ea.; connector, 100 ea.; hook, 20 ea.; latch, 20 ea.; lever, 20 ea., $30,069.

Juneau Stamping & Mfg. Co., 1226 N. 4 St., Milwaukee, bar assembly, 490 ea., $29,978.

Kellogg Switchboard & Supply Corp., 6650 S. Cicero Ave., Chicago, battery weatherproof set, 1,100 ea., $50,116.

Ken-Ro-Bil Corp., Van Buren, Ohio, costumers, 4,058 ea., $27,513.

Ken-Tool Mfg. Co., 768 E. North St., Akron, kit-tire changing, 600 ea., $43,440.

Kings Electronics Co., Inc., 40 Marbledale Rd., Tuckahoe, N. Y., connector plug, 113,000 ea., $46,104.

Kinsey Co., E. A., 335 W. Fourth St., Cincinnati, squaring shear, 4 ea., $54,968.

Kollsman Instr. Corp., 80-08 45 Ave., Elmhurst, N. Y., airspeed indicators, 493 ea., $25,000.

Lackner Co., Inc., Lackner Bldg., Cincinnati, cabin pressure indicator, 1,988 ea., $90,843.

Lewis Eng. Co., 339 Church St., Naugatuck, Conn., indicator, 4,484 ea., $87,504.

Linde Air Products Co. div., Union Carbide & Carbon Corp., New York, liquid oxygen, liquid nitrogen, 28,000,000 cu. ft., $103,000.

Lycoming-Spencer div., Avco Mfg. Corp., Williamsport, Pa., spare parts, $116,156.

Magnaflux Corp., 5900 Northwest Highway, Chicago, penetrant inspection equipment, 6 ea., $71,825.

Mario Papa & Sons, Inc., 121 Main St., Gloversville, N. Y., gloves, leather, 26,668 pr., 15,370 pr., $99,636.

Martin & Co., George E., Oklahoma City, cover assembly, 1,000 ea., $30,630.

McAlister, Inc., J. G., 117 N. McCadden Place, Hollywood, Calif., spare parts, $199,744.

McPhillips & Co., Inc., 239 Bernard St., Trenton, N. J., pack assembly, 16,836 ea., $417,532.

Mead Aviation Equipment Co., 457 Mulberry St., Trenton, N. J., canopy assembly, 7,500 ea., $632,550.

Meriam Instrument Co., 10920 Madison Ave., Cleveland, technical data, 7 ea., $36,440.

Modern Light Co., 7809 Maplewood Ind.

Production expanded to 514% of pre-Korea level

2 NEW MANUFACTURING DIVISIONS

23 COMPLETE UNIT SUB-CONTRACTORS

2300 PARTS SUB-CONTRACTORS

As the world's largest producer of aviation instruments and accessories, we were faced . . . even before Korea . . . with heavy demands on our production. Came Korea and, overnight, demands swelled to tremendous proportions. Enlisting the vast network of helpers shown above, we went all-out in tackling this new, vastly greater assignment. And, indeed, we increased our production output to 514% of our pre-Korea level. But there is yet no time for boasting. Though we're "catching up," much still remains to be accomplished. You can count on us to continue devoting our full energies and capabilities to bringing you critical instruments and accessories in ever-increasing numbers.

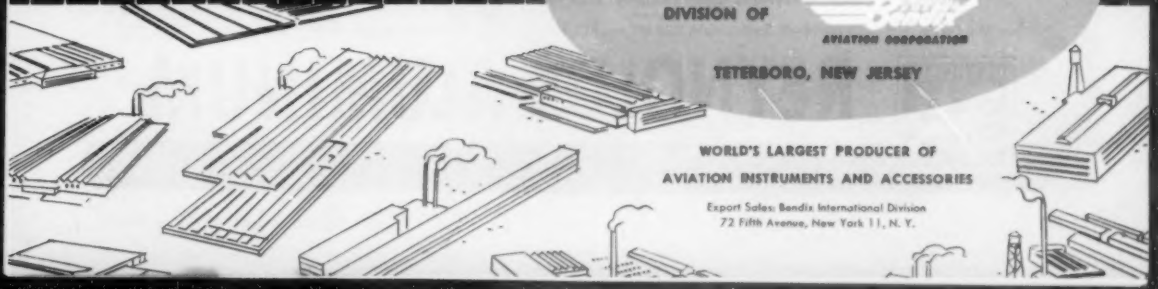
PRODUCTIVE CAPACITY NOW AVAILABLE FOR THESE HIGHLY CRITICAL ITEMS

- Autosyn Remote Indicating Systems
- Flight Instruments
- Warning Units
- Reciprocating Engine Starters
- A.C. and D.C. Generators
- Carbon Pile Voltage Regulators
- Radar Antenna Positioning Systems
- Jet Electric Starters
- Radio Magnetic Indicators
- Omni-Bearing Converter Indicators
- Automatic Pilots and Automatic Approach Systems
- Oxygen Regulators
- Radar Pressurization Equipment
- Engine-Driven Dry Air Pumps
- Turbine-Driven Fuel, Water and Alcohol Pumps
- Ordnance Electrical Equipment
- 400 Cycle Synchros (AY-200 Series Types)
- Special Purpose Servo Amplifiers

Eclipse-Pioneer

DIVISION OF BENDIX AVIATION CORPORATION

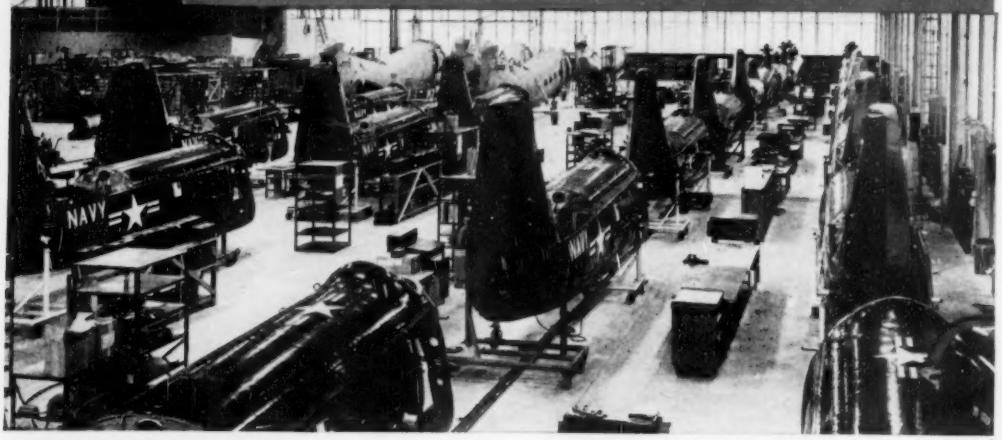
TETERBORO, NEW JERSEY



WORLD'S LARGEST PRODUCER OF AVIATION INSTRUMENTS AND ACCESSORIES

Export Sales: Bendix International Division
72 Fifth Avenue, New York 11, N. Y.

Building the World's Best Aircraft...



for example, the
PIASECKI HUP HELICOPTER
on the assembly line of the Piasecki Helicopter Corporation in Morton, Pennsylvania.

The Piasecki HUP is a tandem rotored helicopter. This six place model is designed for Navy shipboard service. It will be used by the Navy for plane guard rescue, anti-submarine patrol and ferrying personnel between ship and shore.

There is Reynolds Aluminum in almost every airplane that flies today

The aircraft industry has learned to depend on Reynolds for consistently high quality and technical aid in working out problems of development and engineering. Reynolds completely interrelated operations, from the mining of bauxite to the delivery of aluminum in all its forms, assures dependability of supply. And *remember*, as the aircraft industry expands and grows, Reynolds Metals Company keeps pace in supplying and developing aluminum — top *design* metal of today, top *production* metal of tomorrow.

Helpful Material for Your Training Program

Reynolds Aluminum is on the job with literature and movies to help you with your personnel training program—add to your own know-how. The complete library of Reynolds Technical Books on aluminum design and fabrication is available to you for the asking. Please send your request on a business letterhead, otherwise the price of each book is one dollar.

- A-B-C's of Aluminum (from mine to finished products)
- Aluminum Data Book (Aluminum Alloys and Mill Products)
- Aluminum Structural Design
- Designing with Aluminum Extrusions
- Fastening Methods for Aluminum
- Finishes for Aluminum
- Forming Aluminum
- Heat Treating Aluminum Alloys
- Machining Aluminum Alloys
- Welding Aluminum
- Metals Weight Slide Rule

And to instruct large groups of personnel . . . to put more interest in your training program . . . get these 16mm, color-sound films from Reynolds Film Service.

- SHAPE OF THINGS TO COME. Interesting description of the aluminum extrusion process and the design opportunities it provides. Running time 30 minutes.
- TALE OF THE POWDERED PIG. Developments in aluminum powders and pastes including their application in protective and decorative coatings. Running time 22 minutes.
- PIGS AND PROGRESS. The complete story of aluminum from mine to finished products. Covers all forms of aluminum. Running time 26 minutes.

Write to Reynolds Metals Company, 2559 South Third Street, Louisville 1, Kentucky

See "Doc Corkle" with Eddie Mayehoff, Sunday night, 7:30 EST and PCT, NBC-TV; hear "Fibber McGee and Molly" Tuesday night, 9:30 EST, NBC.

REYNOLDS METALS

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

Court, St. Louis, fixture assembly, 1,745 ea., $27,867.

Molded Insulation Co., 335 E. Price St., Philadelphia, connector plugs, 6 ea., $60,880.

Morgan Machine Co., Inc., 1230 University Ave., Rochester, nailing machines, 6 ea., $126,000.

New Castle Products, Inc., 1711 I Ave., New Castle, Ind., protective covers, 2,700 ea., $58,625.

Ohio Hoist & Mfg. Co., P. O. Box 1794, Cleveland 5, hoist, 6000-lb. capacity, 43 ea.; hoist, 2000-lb. capacity, 68 ea., $70,323.

Pease Co., L. F., 152 S. Water St., Providence, cover assembly, 2,100 ea., $28,637.

Perfection TV Mfg. Corp., 4762 Third Ave., New York, crystal holders, 299,000 ea., $88,870.

Radiant Mfg. Corp., 2627 W. Roosevelt Rd., Chicago, screens, $89,323.

Raybestos Manhattan, Inc., Manhattan Rubber div., Passaic, N. J., aircraft hose, $32,361.

Reed Products, Inc., 700 W. Virginia St., Milwaukee, very light flying suit, 100 ea.; light flying suit, 100 ea.; intermediate flying jacket, 730 ea.; intermediate flying trouser, 630 pr., $28,963.

R. I. Insulated Wire Co., Inc., Box 67, Elmwood Station, Providence, wire, 0-600-v, 850,000 ft.; wire, 0-600-v, 400,000 ft., $27,-900.

Ross Carrier Co., Benton Harbor, Mich. spare parts, $55,972.

Royal Electric, Inc., Jamestown, Ohio, Va Inverters, 971 ea., $567,500.

Saginaw Products Corp., Saginaw, Mich., dolly assembly SN 8200-228400, 283 ea.; dolly assembly SN 8200-222500, 283 ea., $110,753.

Silver City Glass Co., Meriden, Conn., crystal units, $114,878.

Sparks-Withington Co., Sparton Automotive div., Jackson, Mich., gun charger, 50,102 ea., $6,091,641.

Speirti-Faraday Inc., Rookwood Place, Cincinnati, projector release control, 5,516 ea., $121,015.

Steelcraft Mfg. Co., Inc., 9017 Blue Ash Rd., Rossmoyne, Ohio, maintenance platforms, data and spare parts, 989 ea., $556,-395.

Steel Products Eng. Co., 1205 W. Columbia St., Springfield, Ohio, stand assembly, 60 ea., $66,846.

Struthers Dunn Inc., 150 N. 13 St., Philadelphia, relays, 850 ea., $52,717.

Sweeney Mfg. Co., B. K., 1601 22 St., Denver, special tools, 25 ea., $162,044.

Switlik Parachute Co., Inc., 1325 E. State St., Trenton, N. J., parachute assembly-P/N 50C7024-7, 1,222 ea.; parachute assembly—P/N 50C7024-10, 151 ea.; pack assembly, 1,260 ea.; parachute assembly—P/N 50C7024-8, 13,802 ea., $2,303,506.

Taller & Cooper, Inc., 75 Front St., Brooklyn, design and install metering and recording panels, 11 ea., $184,674.

Technicraft Corp., 1701 Main Bldg., Kansas City, Mo., wing walkways, 4,647 ea., $28,131.

Telectro Industries Corp., 35-16 37 St., Long Island City, N. Y., amplifier, 385 ea., $157,167; tester, 500 ea., $204,450.

Thompson Products, Inc., 23555 Euclid Ave., Cleveland, material, $32,035.

United States Gauge div., American Machine & Metals, Inc., Clymer Ave., Sellersville, Pa., transmitters, 884 ea., $87,224.

Varo Mfg. Co., Inc., 1801 Walnut St., Garland, Tex., converters, 4,872 ea., $482,779.

Veeder-Root, Inc., 25 Sargent St., Hartford, Conn., ammunition rounds counters, 3,315 ea., $50,439.

Vidolex, Inc., 35-01 Queens Blvd., Long Island City, N. Y., projectors, spare parts, 385 ea., $68,627.

Warren Corp., 2901 Brighton St., Pittsburgh, processing machine, spare parts & data, 20 ea., $370,000.

Watts Mfg. Co., Inc., Ronceverte, W. Va., kit, 184 ea.; spare parts, data, 2 sets, $78,496.

Wheel Trueing Tool Co., Detroit, dressing tools, 5,408 ea., $31,657.

Ackerman-Gould Co., 92 Bleeker St., N. Y., wire marking machines, 706 ea., $295,581.

There is a new
ELECTRONIC
means of determining
if a sealed package
(e.g., a cocoon-packed aircraft)
is moisture-safe.

It is easily installed
- in new packs
- in packs already in storage
- in all types of containers

Every package can be inspected
- without guesswork
- without breaking the pack
- without specially trained personnel

for no more than the cost of the usual destructive 3% spot check.

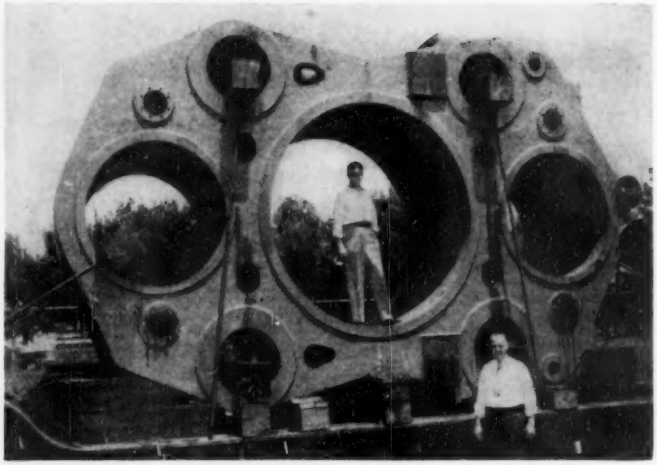
The Armed Services are already using this revolutionary device for "Method II" pack inspection.

Name:

Aminco Hydrotector

For further details, write for Bulletin 2224

American Instrument Co.
Silver Spring, Md.



SHIPPED FROM DUSSELDORF to Alcoa's Lafayette, Ind., plant, this 107-ton . . .

Big Casting Arrives for Big Press

Giant machine will extrude pieces weighing more than a ton—nearly four times Alcoa's present capacity.

The Air Force heavy press program has picked up momentum with the arrival from Germany of five massive castings—backbones for a 13,200-ton extruder. When this monster tool starts squeezing out aircraft structural components at the Lafayette, Ind., plant of the Aluminum Company of America, it will have 2½ times more power than any extrusion press now operating here.

▶ **Casting Data**—Most of the parts for the press are coming from Germany. Some were built during the last war, others after the war and in the past year new parts have been constructed by Schloemann, with an Alcoa engineer overseeing the operation.

Largest of the recently received castings—a 2,210-cu. ft. block of metal—will serve as the new extruder's cylinder housing (see photo). This weighs 107 tons, is 23 ft. long, 8½ ft. wide, 14½ ft. high. Another of the castings is the press platen, weighing 103 tons.

▶ **Extruder Size**—These will be major components in the huge extrusion tool whose general dimensions—exclusive of the runout table which will extend several hundred feet—will be 80 ft. long, 21 ft. wide and with maximum height of 25 ft., of which about 10 ft. will go under ground.

Report is that only one other press of this size has been made—one of the tools confiscated by the Soviet. Another unit was started years ago, but never was completed.

▶ **Capabilities**—Alcoa reports that the new press will squeeze out parts nearly four times the weight of those the company can now extrude—jumping the weight from 600 to 2,300 lb. per piece. Thus, while maximum length of extrusions remains at 90 ft., the part produced will increase from 6.7 lb./ft. of length to 25.5 lb., or from 5.6 sq. in. in cross-section to 21.3 sq. in.

Though the Air Force will have first priority on the tool's output, the extrusion press will also be aimed for non-emergency utility. Alcoa sees in its potential items such as aluminum pipe for the petroleum industry, curtain walls for buildings, and large parts for marine, railroad and truck activities.

The 13,200-ton extrusion press won't be the only one of this type in the Air Force's stable of "heavies." Others, including much larger units, are scheduled for operation within the next two years. These will go into facilities operated by Alcoa, Kaiser Aluminum and Chemical Corp., Harvey Machine Co., Reynolds Metals Co., and Curtiss-Wright Corp. (AVIATION WEEK July 7, p. 38).

▶ **Big Stretch**—To complement its 13,200-ton unit, Alcoa has ordered a new stretcher for straightening the aluminum alloy parts the machine will extrude. This device will have a 3-million-lb. total pull—reported by Alcoa to be four times the force exerted by any existing stretcher. The machine was designed by the company and will be owned by it.

COMPONENTS COUNT

at 600 M.P.H.

The high performance requirements for components in the Republic Thunderjet called for a shut-off valve that would function perfectly under the most difficult conditions. One of these components was a pilot valve to be used in a newly developed fuel system. Valcor Valves MORE than met the rigid specifications . . . they surpassed them in every test!

That is why you find Valcor Valves in the latest Republic Thunderjet today. In this important pilot valve, extremely low pressure drop has been achieved . . . straight-through flow allows greater flow capacity for given-size solenoid. And, the exclusive Valcor floating shear seal functions perfectly even under strong back pressure. Yes, Valcor Valves are precision designed to afford a wide safety margin—they surpass every performance requirement. That's what *counts* in a component.

The Valcor Valve has achieved widespread acceptance in the aviation industry; there are, however, numerous other industrial uses for which the Valcor design can be adapted.

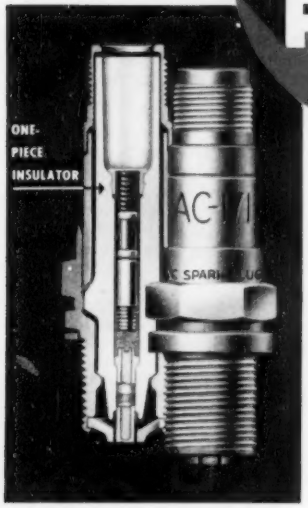
Submit your valve problems to Valcor—our engineering and research departments are at your disposal, without obligation. Send letter or blueprints. Booklet available.

VALCOR ENGINEERING CORP.

314 MARKET STREET NEWARK, NEW JERSEY

AC SPARK PLUGS

The New AC 171 Keeps 'Em Flying



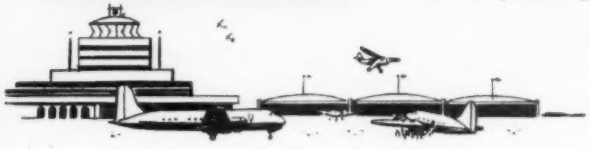
AC's newest development for aircraft—the 171 spark plug —has been approved for the following engines:

R-1820	R-2000	R-3350
R-1830	R-2800	R-4360

In addition, the AC-171 has been selected by the Armed Forces for a record-sized production contract.

War front or home front, this great new plug offers a long list of superior features, including the one-piece insulator, which eliminates flashover and banishes the dirt trap at the base of the terminal well.

Utmost reliability joins with genuine economy to make the AC-171 Spark Plug an outstanding buy for airlines.



AC SPARK PLUG DIVISION
GENERAL MOTORS CORPORATION

Castings Output Handled by Pool

A plan to wrap up casting and machine services indicates simplification of procurement problems for aircraft industry users of turbine blades and other parts made by the precision investment method.

This complete-service plan has been inaugurated by the Hitchiner Products Corp., W. Hartford, Conn., a company activated primarily to finish precision investment castings of the Hitchiner Mfg. Co., Milford, N. H. Hitchiner Products has organized a group of job shops to perform the secondary operations on Hitchiner castings.

Aim of the service is to eliminate excessive costs of subcontracting and handling by making one company responsible for supplying the finished castings. Hitchiner Products reports it will mean but one purchase order being placed, one point to contact for expediting and one inspection of the finished castings.

Hitchiner Products supplies the necessary engineering and inspection supervision and coordinates the scheduling and output of each shop to insure that specs and delivery are met.

The company program also includes machining of other types of castings and metal parts.

Collapsible Tank Holds 20,000 Gal.

The 4-ft.-wide rim above is the sidewall of a 26-ft.-diameter nylon tank for advance-base storage of 20,000 gal. of aviation fuel. The wall is comprised of two sections 2 in. apart, coated inside and out with rubber compound.

Top and bottom tank surfaces are attached to the wall with vulcanized reinforcing strips. Tank bottom contains two 6-in. fittings for fuel inlet and outlet. Top surface has sufficient slack to form a flexible cap that drapes over the inside wall and tank bottom when the unit is empty. As fuel is pumped in, the cap floats on the surface of the liquid to eliminate fuel vaporization and water condensation from any air in the tank.

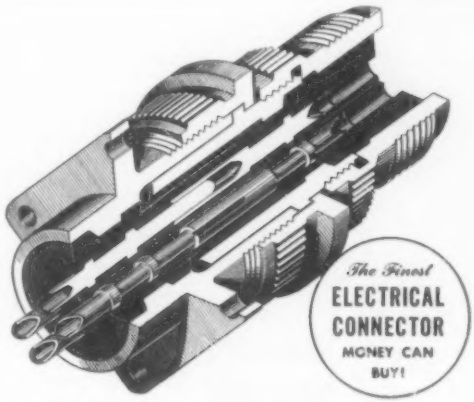
Unit will stand erect with 6 psi. of air pressure pumped through a valve into the space between the sidewalls. This air also affords insulation from heat and cold. With air drawn from between the sidewalls, the tank can be collapsed, quickly rolled and stored. Another design version has double top

SCINFLEX ASSURES

YOU PEAK PROTECTION

AGAINST CIRCUIT FAILURE

When operating conditions demand an electrical connector that will stand up under the most rugged requirements, always choose Bendix Scinflex Electrical Connectors. The insert material, an exclusive Bendix development, is one of our contributions to the electrical connector industry. The dielectric strength remains well above requirements within the temperature range of −67°F to +275°F. It makes possible a design increasing resistance to flashover and creepage. It withstands maximum conditions of current and voltage without breakdown. But that is only part of the story. It's also the reason why they are vibration-proof and moisture-proof. So, naturally, it pays to specify Bendix Scinflex Connectors and get this extra protection. Our sales department will be glad to furnish complete information on request.



BENDIX SCINFLEX

ELECTRICAL CONNECTORS

Bendix

• Moisture-Proof • Radio Quiet • Single Piece Inserts • Vibration-Proof • Light Weight • High Insulation Resistance • High Resistance to Fuels and Oils • Fungus Resistant • Easy Assembly and Disassembly • Fewer Parts than any other Connector • No additional solder required.

SCINTILLA MAGNETO DIVISION of SIDNEY, NEW YORK

Bendix AVIATION CORPORATION

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.

FACTORY BRANCH OFFICES: 118 E. Providencia Ave., Burbank, Calif. • Stephenson Bldg., 6560 Cass Ave., Detroit 2, Michigan • Brouwer Bldg., 176 W. Wisconsin Avenue, Milwaukee, Wisconsin • 582 Market Street, San Francisco 4, California

This bolt of flame from the afterburners of the U.S. Air Forces' Northrop Scorpion F-89 is spectacular evidence of the intense heat generated by jet power. Refrasil Blankets are used on the F-89's twin-engines because they are light in weight and are easily removable, as well as high in insulation efficiency. In a blanket thickness of one half inch, a temperature drop of approximately 900° F. is accomplished! These are reasons why Refrasil Lightweight Removable Insulation Blankets are specified by 90% of jet aircraft makers.

Refrasil Insulating Blanket installed preformed on the J-35 Turbojet engine's air bleed manifold lines.

Refrasil Insulating Blankets installed on the air bleed manifold lines and afterburner of the J-35 Turbojet engine.

REFRASIL

Refrasil is available in a variety of forms to help solve your high temperature problems. Attach this ad to your letterhead and mail today for illustrated literature.

WRITE OR CALL YOUR NEAREST REPRESENTATIVE:

EASTERN: Boyd W. Muhlenfeld, Jr., 6609 Loch Hill Rd., Baltimore 12, Md., Valley 3130

TEX.-OKLA. & KANSAS: Thompson Engineering Service, 708 Hemphill St., Fort Worth 4, Texas, Parkview 3240

MIDWEST: Burnie L. Woodle, 3219 West 79th St., Indianapolis 22, Ind., Hickory 8683

HITCO

THE H. I. THOMPSON COMPANY
1731 CORDOVA STREET
LOS ANGELES 7, CALIF.

and bottom surfaces for filling with air for additional insulation.

Tiedown gear attached to nine points around tank periphery secures against wind effects when unit is empty.

The tank was designed and built for the Marine Corps by D&R Mfg. Laboratories, Inc., New York City. Construction of a 42-ft.-diameter, 40,000-gal. unit is now underway.

Shape of the tank is not confined to a circle. One design contemplates fitting the unit to an aircraft interior to eliminate the need for flying fuel in drums. In this case the fuel could be drained from the tank at point of destination and the tank collapsed and stored in the plane so that other cargo could be toted for the return trip.

Oxygen Training Service Set Up

A new service aimed to stress oxygen education for airframe manufacturers and airlines has been set up for both flight and ground personnel. Altitude, Inc., El Segundo, Calif., will conduct indoctrination and technical training programs in all phases of aircraft oxygen systems and functions.

Personnel will be given "flights" in an altitude chamber to acquaint them with sensations of oxygen lack and use of equipment under operating conditions. Airframe design engineers can learn equipment positioning hazards.

The company's altitude chamber—a 20-man unit constructed to Aircraft Industries Assn. specifications—also will be available on a contract basis for high altitude research.

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$3.00 PER YEAR
32 PAGES MINIMUM

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Foundry Core Boxes For Small Output

A series of 14 cylindrical core boxes to simplify foundry work has been developed at the National Bureau of Standards in diameters ranging from ¾ to 2 in. in ¼-in. increments.

These units could find application in casting jobs for the aviation industry where limited quantities of brackets, fuel and hydraulic system fittings and special articles are turned out for experimental or modification projects, in contrast to large runs for which individual special cores would be justified.

In the NBS series, there is one box for each diameter core. Length of each box has been fixed at the maximum likely to be required for a core of that diameter, as shown by experience. Shorter cores can be cut from full-length units or made by placing proper length wood cylindrical pieces in the core-box cavity.

When a core with a tapered end is required, a brass insert with standardized taper is placed in the core box. Each insert is 1/32 in. smaller in diameter than the core box it complements, to facilitate placing it at the bottom of the box before ramming the sand. Tapers are standardized at 15 deg., instead of the wide variety of tapers encountered in common practice. There is a standard vertical length for the tapered insert adopted for each core diameter.

Though this simplified system of cylindrical core boxes was fabricated of wood for NBS' experimental foundry, metal makeup might prove more satisfactory in production work, say NBS technicians Richard H. Harwell and J. H. Schaum, who devised it.

Crack Down on Slow Contractors

Dayton—Air Materiel Command headquarters canceled 71 contracts during fiscal 1952 ended June 30, for default, indicating a new USAF policy of "deliver or else." Dollar volumes of the contracts were not available as many of the instruments still are undergoing liquidation.

There are excusable factors in delivery delinquency: failure to obtain materials or subcontracted components as promised, labor difficulties, financial problems, changes in government re-

INFORMATION on positions at NORTHROP

Northrop Aircraft, Inc. is engaged in vitally important projects in scientific and engineering development, in addition to aircraft production. The program is diversified, interesting and long-range. Exceptional opportunities await qualified individuals.

The most responsible positions will go to top-caliber engineers and scientists. However, a number of excellent positions exist for capable, but less experienced, engineers. Some examples of the types of positions now open are:

BOUNDARY LAYER RESEARCH SCIENTISTS... ELECTRONIC PROJECT ENGINEERS... ELECTRONIC INSTRUMENTATION ENGINEERS... RADAR ENGINEERS... FLIGHT-TEST ENGINEERS... STRESS ENGINEERS... AERO- AND THERMODYNAMICS... SERVO-MECHANISTS... POWER-PLANT INSTALLATION DESIGNERS... STRUCTURAL DESIGNERS... ELECTRO-MECHANICAL DESIGNERS... ELECTRICAL INSTALLATION DESIGNERS... ENGINEERING DRAWING CHECKERS

Qualified engineers and scientists who wish to locate permanently in Southern California are invited to write for further information regarding these interesting, long-range positions. Please include an outline of your experience and training.

Allowance for travel expenses.

Address correspondence to Director of Engineering, Northrop Aircraft, Inc. 1021 E. Broadway, Hawthorne, California

DEFENSE!

Devastating armament, advanced search and navigation equipment and high speed make the Air Force's new Northrop F-89 Scorpion a powerful defensive weapon. Like the Northrop Black Widow P-61 of World War II, the Scorpion was designed from the outset to do a specialized job superlatively well. This new all-weather interceptor is another product of the long experience of Northrop's top designers and craftsmen.

NORTHROP AIRCRAFT, INC.

HAWTHORNE • CALIFORNIA

PIONEER BUILDERS OF NIGHT AND ALL-WEATHER FIGHTERS

quirements, acts of God and acceptance of too much other business.

But inexcusable, for example, was the case of a major contractor, who passed USAF inspection on his subcontractor setup and delivery quotations from these subs that permitted fulfillment of delivery schedules, then solicited additional quotes from another group of subs who failed to come through in time.

Before starting cancelation proceedings, the procurement division buyer determines whether the action would be in the government's best interest. He weighs the contractor's inability to produce, effect of cancelation on allied contracts, availability from other sources, urgency of the requirement (including time loss involved in vesting the procurement in another source), design changes in the item which may have slowed output, and whether the original delivery schedule was phased so that the contractor had an advantage over competitors.

Fast Writeoffs

Accelerated tax amortization for manufacturers expanding their defense facilities is granted by the government in the form of certificates of necessity.

In the following list of recent certificates, company name is given, followed by product or service, cost of construction deemed necessary for defense expansion, and the percentage of the expansion cost allowed for fast write-off. Fast write-off permits property to be depreciated in five years.

• **Precision Methods and Machines, Inc.**, Waterbury, Conn., aircraft parts, $133,681, 55%.

• **Standard-Thompson Corp.**, Boston, aircraft parts, $91,361, 65%.

• **W. H. Nichols Co.**, Waltham, Mass., aircraft parts, $22,912, 65%.

• **General Electric Co.**, Burlington, Conn., aircraft parts, $90,091, 65%.

• **The M. B. Mfg. Co., Inc.**, New Haven, Conn., aircraft parts, $132,989, 60%.

• **Connecticut Metal Treating Co., Inc.**, Bridgeport, heat treating of aircraft parts, $30,000, 45%.

• **American Bosch Corp.**, Springfield, Mass., aircraft parts, $171,096, 65%.

• **Anemostat Corp. of America**, Hartford, aircraft components, $25,581, 65%.

• **Swan Tool and Machine Co.**, Hartford, machine tools and aircraft parts, $47,483, 70%.

• **B. A. Lalli Co.**, Stratford, Conn., aircraft parts, $55,700, 55%.

• **Island Machine Co., Inc.**, Farmingdale, N. Y., aircraft parts, $12,543, 70%.

• **Fairchild Engine and Airplane Corp.**, Long Island, aircraft parts, $30,014, 65%; Hagerstown, Md., airplanes and parts, $458,792, 65%; Bayshore, Suffolk County, N. Y., aircraft parts, $213,148, 65%.

• **Newark Machine Co., Newark**, aircraft parts, $23,479, 70%.

• **Viking Tool and Machine Co.**, Belleville, N. J., aircraft parts, $26,341, 70%.

• **Eton Machine Co., Inc.**, Farmingdale, N. Y., aircraft parts, $4,161, 70%.

• **Republic Aviation Corp.**, Long Island, aircraft and spare parts, $85,685, 40%.

• **Air Cruisers Co.**, Monmouth County, N. J., aircraft accessories, $170,000, 40%.

• **Bendix Aviation Corp.**, Teterboro, N. J., aircraft parts, $29,300, 40%; Scintilla Magneto Division, Sidney, N. Y., aircraft parts, $18,259, 65%; Hamilton, Ohio, aircraft parts, $37,589, 60%; Towson, Md., electronic equipment, $28,189, 65%; South Bend, Ind., aircraft parts, $138,134, 55%; North Hollywood, electronic products, $17,738, 60%; Pioneer Central Division, Davenport, Iowa, aircraft parts, $43,264, 60%.

• **Kearfott Mfg. Corp.**, Newark, aircraft parts, $1,507, 70%.

• **Aircraft Engineering Products, Inc.**, Clifton, N. J., aircraft parts, $29,207, 65%.

• **Sier-Bath Gear and Pump Co., Inc.**, South Hackensack, N. J., aircraft parts, $925,000, 30%.

• **Hetherington, Inc.**, Sharon Hills, Pa., aircraft parts, $15,500, 45%.

• **Avco Mfg. Co.**, Lycoming-Spencer division, Williamsport, Pa., aircraft parts, $80,132, 50%.

• **Eastern Rotocraft Corp.**, Doylestown Township, Pa., aircraft parts, $29,550, 40%.

• **Glenn L. Martin Co.**, Baltimore, aircraft parts, $17,930, 65%.

• **Brunswick-Balke-Collender Co.**, Marion, Va., aircraft parts, $73,672, 70%.

• **Western Electric Co., Inc.**, Greensboro, N. C., aircraft parts, $119,704, 55%.

• **Michigan Steel Castings Co.**, Detroit, aircraft parts, $5,834, 70%.

• **Aircraft Precision Products, Inc.**, Oak Park, Mich., aircraft parts, $9,873, 45%; aircraft parts, $29,000, 45%; aircraft parts, $36,876, 70%.

• **Miller Industries**, Jackson, Mich., aircraft parts, $47,564, 70%; aircraft parts, $14,590, 65%.

• **Manistique Tool and Mfg. Co.**, Manistique, Mich., aircraft parts, $19,906, 70%.

• **Vinco Corp.**, Detroit, aircraft parts, $42,087, 70%; aircraft parts, $26,255, 65%; aircraft parts, $17,705, 65%.

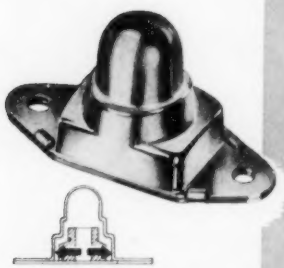
• **Detroit Plastic Fixture Co.**, Detroit, aircraft parts, $4,569, 65%.

• **Farm Tools, Inc.**, Cleveland, aircraft parts, $15,814, 70%.

• **Michigan Steel Casting Co.**, Detroit, aircraft parts, $2,151, 65%.

• **United Aircraft Products, Inc.**, Dayton,

cut installation time
cut maintenance time
this self locking
FLOATING DOME NUT
Seals: integral fuel tanks
pressure tight bulkheads
with standard sealing compounds



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Manufacturers of self locking anchor nuts and bolt and nut retainers.
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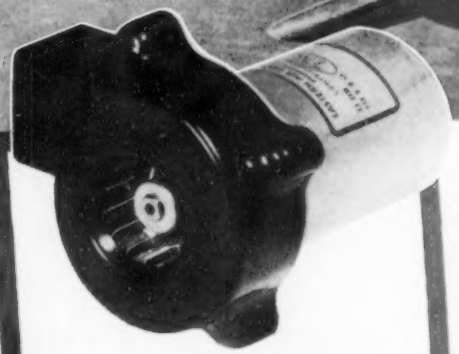
Citrus 4-4191 CHapman 5-3693

This nut floats 1/32" in all directions and is interchangeable with fixed type. Time is saved because it does not require accurate placement of plate nut over hole.

4600-2 SERIES
Meets applicable requirements of AN-N-10 specification.

WRITE FOR SAMPLES
Write on your letterhead for samples and ENGINEERING MANUAL. Manual contains dimensions, tolerances and material specifications.



J 55-C CENTRIFUGAL BLOWER

Overall Dimensions
(3-11/16"x2-29/32"x2-15/16")

SPECIFICATIONS:

- 115 Volts
- 400 Cycles
- 7000 RPM
- Single Phase
- 1 Amperes
- 1.12 lbs. wgt.
- 13 CFM 0" Static Pressure

Meets all military specifications for corrosion resistance, fungus-proof, humidity, shock and vibration.

APPLICATIONS

- VENTILATING EQUIPMENT
- RADAR EQUIPMENT
- AMPLIFIER UNITS
- TRANSMITTERS
- OSCILLATORS

TWA *specifies* EAD

Centrifugal Blowers for their new Super Constellations

This new 60 ton giant is scheduled for TWA coast-to-coast service this fall. It is 113½ feet long . . . has a wingspread of 123 feet . . . and can carry 64 passengers at more than 300 miles per hour. It's the world's largest commercial airliner . . . utilizing the finest safety and comfort features conceivable.

Right in the heart of this giant's main electrical system TWA specified EAD's J 55-C Centrifugal Blowers, to cool the vital voltage regulators. These amazing midgets weighing only approximately 18 ounces met every rigid specification. Another outstanding example of EAD's ability to produce the finest in rotating electrical equipment.

"Choose EAD for reliability"

Solving Special Problems is Routine at E A D

If your problem involves rotating electrical equipment, bring it to EAD. Our completely staffed organization will modify one of our standard units or design and produce a special unit to meet your most exacting requirements.

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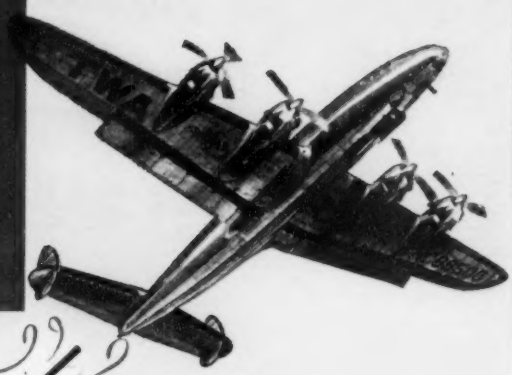
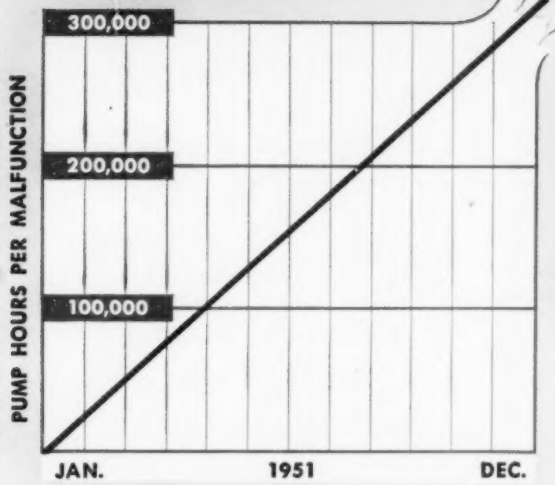




VICKERS

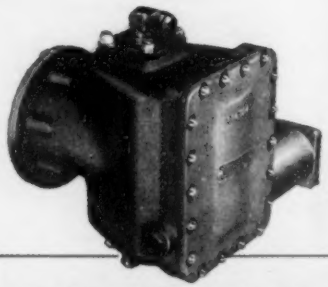
3000 psi VARIABLE DISPLACEMENT PUMPS

ON TWA CONSTELLATION CABIN SUPERCHARGER DRIVES

There can be no question of the reliability and lasting qualities of Vickers equipment when it hangs up records like this. TWA maintenance records for 1951 indicate only one unscheduled removal of a Constellation cabin supercharger drive pump in a total of 304,578 pump hours.

These TWA Constellations make use of numerous Vickers Hydraulic units. Besides variable displacement pumps (for main hydraulic system as well as cabin supercharger drive), there are hydraulic motors, pressure reducing valves, relief valves, unloading valves, and accumulators.

Vickers Hydraulic Equipment for aircraft is so widely preferred because it is compact, efficient, light weight . . . but above all dependable.



This is the reversible flow pump used in the Constellation supercharger drive, one of a wide variety of variable displacement piston type pumps available from Vickers. For further information write for new Bulletin A-5203.

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

aircraft parts, $145,669, 70%.

• **Perfection Stove Co.**, Cleveland, aircraft parts, $25,098, 70%.

• **Shakespeare Co., Kalamazoo**, aircraft instruments, $24,506, 70%.

• **Cleveland Pneumatic Tool Co.**, Cleveland, aircraft parts, $31,958, 60%.

• **Aluminum Co. of America**, Lafayette, Ind., aluminum extruded structural shapes, $1,750,500, 75%.

• **The Dow Chemical Co.**, Madison, Wis., magnesium extrusions for aircraft, $994,500, 65%.

• **Monument Engineering Co., Inc.**, Indianapolis, aircraft parts, $42,860, 45%.

• **Borg-Warner Corp.**, Chicago, aircraft parts, $450,000, 40%.

• **Sanitary Seale Co.**, Belvidere, Ill., aircraft parts, $11,900, 65%.

• **National Die Casting Co.**, Chicago, aircraft parts, $15,981, 45%.

• **The Flour City Ornamental Iron Co.**, Minneapolis, aircraft parts, $189,430, 65%.

• **Century Engineering Corp.**, aircraft parts, $37,034, 65%.

• **Aircraft and Automotive Products Co.**, Wichita, components for military end items, $68,795, 55%.

• **Jonco Aircraft Corp.**, Shawnee, Okla., aircraft assemblies, $206,075, 65%.

• **Solar Aircraft Co.**, Des Moines, aircraft components, $20,253, 70%; aircraft parts, $1,449, 70%.

• **Continental Can Co., Inc.**, Coffeyville, Kan., aircraft parts, $48,007, 65%.

• **Beech Aircraft Corp.**, Wichita, aircraft and parts, $48,399, 45%.

• **Bell Aircraft Corp.**, Fort Worth, military helicopters, $91,982, 65%.

• **Lockheed Aircraft Corp.**, Burbank, aircraft and spare parts, $37,727, 40%; $108,675, 40%; $38,468, 65%.

• **B. H. Hadley Co.**, Pomona, Cal., aircraft parts, $25,566, 70%.

• **Weber Aircraft Corp.**, Burbank, aircraft parts, $29,975, 65%.

• **Forrest Wagniere Engineering Co.**, Culver City, Cal., aircraft parts, $6,287, 70%.

• **Magna Mill Products**, South Gate, Cal., aircraft parts, $145,285, 65%.

• **General Metals Corp.**, Burbank, aircraft parts, $25,231, 60%.

• **Holly Mfg. Co.**, Pasadena, aircraft parts, $44,435, 70%.

• **Airdraulics Co.**, Pasadena, aircraft parts, $10,026, 65%.

• **Douglas Aircraft Co., Inc.**, El Segundo, Cal., airplanes and spare parts, $69,127, 60%.

• **Cook Research Laboratory**, Menlo Park, Cal., aircraft parts, $74,353, 50%.

• **Manlove Manufacturing Co.**, Los Angeles, aircraft parts, $11,720, 70%.

• **AiResearch Mfg. Co.**, Los Angeles, aircraft parts, $59,219, 60%; Phoenix, Ariz., aircraft accessories, $213,077, 65%.

• **Hydro-Aire, Inc.**, Burbank, aircraft parts, $43,750, 45%.

• **Monogram Mfg. Company**, Culver City, Cal., aircraft parts, $296,215, 55%.

• **Pastushin Aviation Corp.**, Los Angeles, aircraft parts, $35,000, 45%.

• **Langdon Mfg. Co.**, Glendale, Cal., aircraft parts, $5,535, 45%.

• **Curtis Laboratories, Inc.**, Los Angeles, aircraft components, $7,189, 65%.

• **E. B. Wiggins Oil Tool Co., Inc.**, Los Angeles, aircraft parts, $46,896, 65%.

• **Ryan Aeronautical Co.**, San Diego, aircraft parts, $5,978, 70%.

• **O. and M. Machine Co., Inc.**, Los Angeles, aircraft parts, $55,207, 65%.

Narmco Mfg. Co., San Diego, aircraft parts, $39,894, 65%.

• **Kasco Machine and Engineering Co.**, Los Angeles, aircraft parts, $8,760, 70%.

• **Korry Mfg. Co.**, Seattle, Aircraft parts, $102,838**, 50%. (**This figure to be revised at a later date upon determination of the cost of certain facilities.)

• **Mercury Aircraft Inc.**, Hammondsport, N. Y., aircraft assemblies, $43,142, 65%.

• **Aero Products Co.**, Farmingdale, N. Y., aircraft parts, $4,553, 70%.

• **Magnus Tool & Die Co.**, Newark, aircraft parts, $38,110, 80%.

• **U. S. Testing Co., Inc.**, Hoboken, aircraft parts, $17,500, 70%.

• **American Brake Shoe Co.**, Mahwah, N. J.,

LEWIS
Selector Switches

FOR RESISTANCE THERMOMETERS AND THERMOCOUPLE THERMOMETERS

EACH SWITCH HAS "OFF" POSITION PLUS NUMBER OF POINTS LISTED.

Points	Size	Switch Part Numbers Thermocouple Type	*3 Wire Resistance-Thermometer Type
2	2"	11S2	36SR2
3	2"	11S3	36SR3
4	2"	11S4	36SR4
5	3"	10S5	37SR5
6	3"	10S6	37SR6
8	3"	10S8	37SR8
9	3"	10S9	37SR9
10	3"	10S10	37SR10
12	3"	10S12	37SR12
16	3"	10S16	37SR16
18	3"	10S18	37SR18
20	3"	10S20	37SR20
24	4"	27S24B2	38SR24
28	4"	27S28B4	38SR28
40	4"	38S2C	

*Resistance thermometer switches are provided with a safety resistor on off position.

2" SIZE

3" SIZE

SPECIAL SWITCHES

No. 37S6C2, Four "4 Point and OFF" thermocouple switches combined in one 3" case.

No. 9S5, Single Pole, Four Point Instrument Switch in 1¼" round case.

No. 44S4, Six Pole, Double-throw Instrument Switch in 2½" round case, one hole mounting, ½-32 threaded bushing.

DESIGNED FOR TEST WORK AS WELL AS FOR PERMANENT INSTALLATIONS. LEWIS SELECTOR SWITCHES ARE CONSTRUCTED WITH STURDY CONTACTS OF LOW RESISTANCE AND POSITIVE DETENT. THESE SWITCHES ARE SPLASHPROOF, DUSTPROOF AND ARE BUILT TO GIVE YEARS OF SERVICE.

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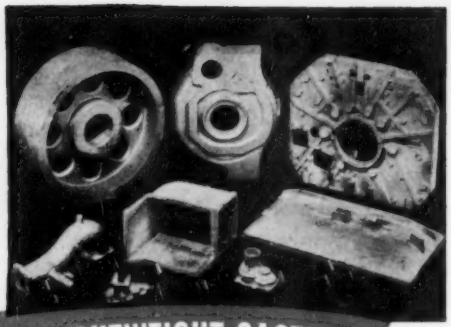

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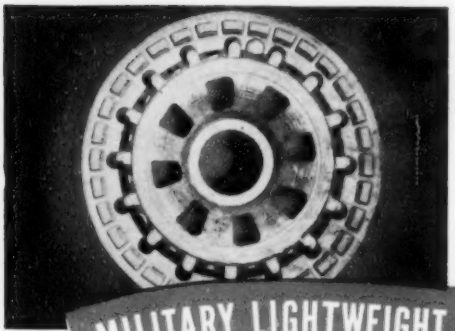
Your commercial requirements for lightweight castings in aluminum or magnesium may be tough, but we'd welcome an opportunity to look them over. We've tackled a good many diversified casting problems over almost a half century.

Our four completely equipped plants and their trained personnel are at your disposal.



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MILITARY LIGHTWEIGHT CASTINGS

Aircraft wheels, strut parts, engine parts and miscellaneous components are being made every day at our plants, in aluminum and magnesium. X-Ray inspection, close attention to detail, complete facilities for production in sand, semi-permanent and permanent mold form.

Well-Made Wood and Metal Patterns
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metal castings for aircraft, $200,000, 50%.

• **American-LaFrance-Foamite Corp.**, Elmira, N. Y., crash fire trucks for Air Force, $185,048, 50%.

• **Media Machine Works, Inc.**, Media, Pa., aircraft parts, $24,000, 45%.

• **Standard Machine Products**, Philadelphia, aircraft parts, $75,000, 45%.

• **Townsend Co.**, New Brighton, Pa., aircraft parts, $159,500, 65%.

• **Towle & Son Co.**, Philadelphia, aircraft parts, $1,586, 70%, and $10,720, 80%.

• **Athas Body Corp.**, Philadelphia, aircraft parts, $90,000, 65%.

• **Hetherington, Inc.**, Sharon Hill, Pa., aircraft electrical switches, $2,619, 65%.

• **H & H Mfg. Co., Inc.**, Clifton Heights, Pa., aircraft parts, $44,826, 80%.

• **Pottstown Plating Works, Inc.**, Pottstown, Pa., aircraft parts, $12,022, 70%.

• **All American Airways, Inc.**, Washington, aircraft parts, $14,117, 75%.

• **Quality Tool & Machine**, Akron, machining aircraft parts, $10,175, 65%.

• **Thompson Products, Inc.**, Cleveland, aircrafts parts, $270,000, 65%, and $73,912, 65%.

• **Holsman Mfg. Co.**, Cleveland, aircraft parts, $17,171, 65%.

• **The Canton Drop Forging & Mfg. Co.**, Canton, Ohio, aircraft parts, $84,728, 65%.

• **H & A Tool Co.**, Detroit, aircraft parts, $26,480, 70%.

• **Bendix Aviation Corp.**, Butler County, Hamilton, Ohio, aircraft parts, $51,269, 65%.

• **Pattern Products Mfg. Co.**, Detroit, aircraft parts, $38,999, 80%.

• **The Metal Equipment Co.**, Cleveland, aircraft and ordnance parts, $35,500, 70%.

• **Swedlow Plastics Co.**, Youngstown, acrylic products for aircraft, $3,435, 60%.

• **Smith-Morris Co.**, Ferndale, Mich., aircraft parts, $104,893, 65%.

• **Jack & Heintz, Inc.**, Bedford, Ohio, aircraft parts, $160,039, 65%.

• **Hyland Machine Co.**, Dayton, aircraft parts, $28,123, 80%.

• **B. F. Goodrich Co.**, Troy, Ohio, aircraft parts, $314,200, 65%.

• **Nuck Mfg. Co.**, Macomb Co., Mich., precision fasteners for aircraft, $1,405,000, 30%.

• **Brake Industries, Inc.**, Ferndale, Mich., aircraft parts, $9,152, 80%.

• **Redford Lathe Turning Co.**, Detroit, aircraft parts, $33,770, 60%.

• **Commercial Steel Treating Corp.**, Detroit, heat treating of metals for aircraft and ordnance parts, $10,891, 70%.

• **R. H. Freitag Mfg. Co.**, Akron, aircraft parts, $538,554, 55%.

• **Bohn Aluminum & Brass Corp.**, Hamtramck, Mich., aircraft parts, $336,000, 65%.

• **Dow Chemical Co.**, Bay City, Mich., magnesium castings for aircraft, $660,000, 65%.

• **M. C. Manufacturing Co.**, Lake Orion, Mich., aircraft parts, $45,000, 45%.

• **General Fireproofing Co.**, Youngstown, aircraft parts, $800,000, 40%.

• **Chicago Cutting Die Co.**, Chicago, aircraft parts, $65,523, 40%.

• **American Phenolic Corp.**, Chicago, aircraft parts, $334,144, 65%.

• **Portland Forge & Foundry Co.**, Portland, Ind., forgings for aircraft, $179,964, 65%.

• **Configured Tube Products Co.**, Chicago, aircraft parts, $5,024, 70%.

• **General Motors Corp.**, Indianapolis, aircraft components, $5,101,500, 45%.

• **LCN Closers, Inc.**, Princeton, Ill., aircraft parts, $30,000, 40%.

• **Biddle Mfg. Co., Inc.**, Racine, aircraft and ordnance parts, $25,909, 80%.

• **Anderson Inc.**, Chicago, aircraft parts, $90,000, 65%.

• **Radiant Mfg. Co.**, Chicago, aircraft parts, $67,423, 65%.

• **Flexonics Corp.**, Elgin, Ill., aircraft assemblies, $85,979, 70%.

• **Meco, Inc.**, Paris, Edgar County, Ill., aircraft parts, $22,750, 75%.

• **United States Rubber Co.**, Mishawaka, Ind., fuel cells for aircraft, $87,594, 50%.

• **Quality Control Corp.**, Chicago, aircraft parts, $35,934, 80%.

• **Scott-Atwater Mfg. Co., Inc.**, Minneapolis, aircraft and ordnance parts, $35,916, 70%.

• **Kratz Corp.**, St. Louis, aircraft parts, $22,459, 70%.

it's a matter of

PRECISION!

The lift, the power, the drive . . . yes, the air-borne heart . . . of the YH-21 Piasecki "WORK-HORSE" Helicopter are delivered by the three transmissions shown here . . . the forward, mid and aft. For *this* kind of component fabrication, the best single manufacturing asset is the PRECISION for which *Steel Products* is famous!

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engineers and manufacturers • Springfield, Ohio

LOADED WITH ELECTRONICS, USAF's F-86D all-weather interceptors foreshadow developments of the next decade, as . . .

Eaker Sees Fully Avionic Plane by '60

- **Manned bombers are 'doomed' to give way to missiles for strategic, tactical uses, Hughes manager says.**
- **But equipment is getting so complex, we must adopt 'systems philosophy' and design plane as a unit.**

The U. S. will have an interceptor whose avionics equipment will enable it to take off, navigate, track down its target, return to base, and land completely automatically, perhaps in the period of 1955-60, Ira Eaker, vice-president of Hughes Aircraft told the Air Force Assn. at its recent Detroit convention.

Eaker said that the interceptor pilot will then be a "human assistant for his electronic partner," which will even provide for "automatic selection of armament, including guided missiles."

Eaker's prediction carries considerable weight because he is a former lieutenant general, and commanding officer of the Eighth Air Force, and because he now runs one of the country's fastest-growing avionics manufacturers in the important guided missile and interceptor fire control fields.

▶**Systems Philosophy**—Eaker stressed the "systems philosophy" of avionics design which is fast gaining favor in Air Force circles. Eaker said "the whole system, if it is to be successful, must be developed for a particular missile or plane by the same laboratory and group of scientists and technicians."

Avionics equipments have become so complex and interrelated to the airplane as well as to themselves that they "must be designed into the airplane, or better still, the airplane must be designed around them." Eaker warned.

▶**Things To Come**—Eaker looked into his crystal ball (undoubtedly clouded by security limitations) and predicted:

- **Ground-to-air missiles** will supplement the automatic interceptor for point defense, perhaps in the 1955-60 period. Missiles will eventually displace the interceptor completely.
- **Manned-bombers are doomed** to be replaced by missiles for both strategic and tactical bombing. We are "close to (that) period," Eaker said.
- **$20-billion gross business** for the electronics industry in the event of all-out war. Eaker placed industry's 1952 gross at $5 billion, ten times 1940's.
- 75% **of total cost** of weapons of the future (guided missiles) may go for avionics equipment.

To meet this "revolutionary trend," Eaker said, " there is now being created a new electronics industry" not only from the radio, TV, and communications fields, but from the aircraft industry as well.

▶**The Most Complex**—Eaker called avionics equipment the most complex per pound and said it had the highest degree of newness of any kind of military equipment. He admitted that the scientists who develop this equipment, and the military who use it, sometimes become discouraged over this complexity and "the pace with which new developments require constant change."

"We are not our own masters," Eaker said. "The weapons race has already produced destructive devices (of) such speed and operating at such altitudes that the human mind and human muscular reaction is not fast enough."

Eaker warned that the pilot can no longer accomplish his mission at "transonic and supersonic speeds in all weather, day and night . . . without . . . automatic devices for . . . target finding, gun aiming, rocket and guided missile launching and control, bomb aiming, identification, and navigation."

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EAKER: Design avionics into the plane, or the plane around avionics.

would abandon the concept of complex automatic all-weather interceptors in favor of thousands of cheap day-fighters, Eaker cautioned that all of the day-fighters in England during the war couldn't stop Hitler's V-1 buzz-bomb attack.

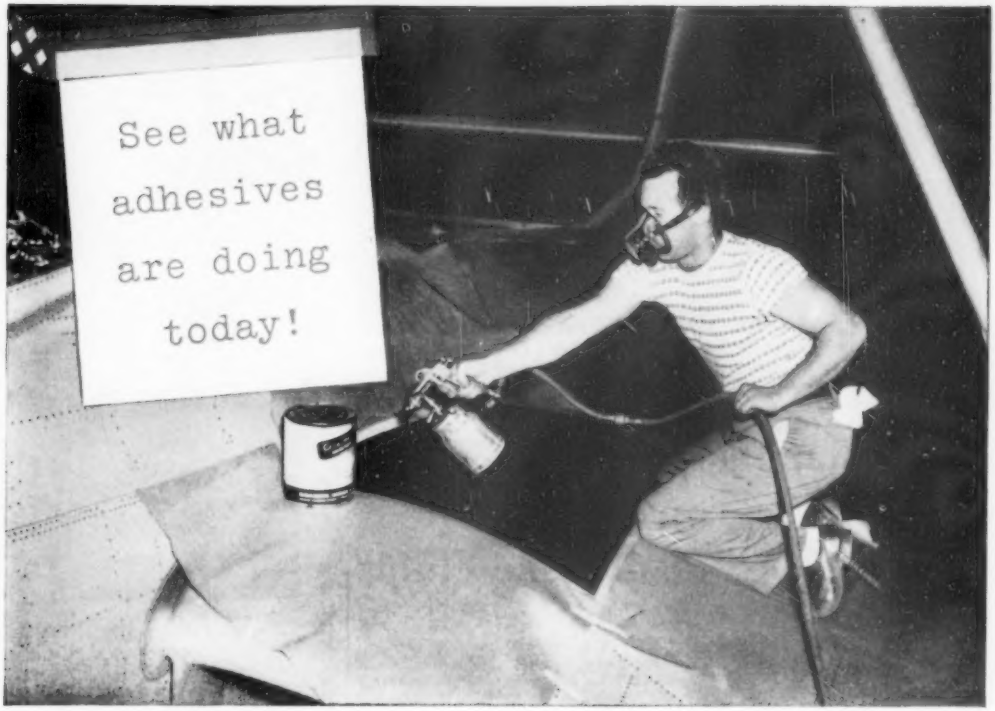
We have profited, Eaker said, from the German technique of constructing complex gunsights of many small "black boxes." When failure occurred, the Germans used simple test equipment to show which black box was at fault and it was quickly replaced. "This unit replaceability concept is only one of many fundamental ideas" being used today to simplify maintenance, Eaker said.

▶**Avionics Maintenance Record**—Eaker cited grounds for optimism on the maintenance problem. He said that records of a field combat interceptor squadron with thousands of flight hours showed that only 21% of the total maintenance hours went into the interceptor's complex avionics fire control system (including radar and gunsight). This compared with 22% for armament and 50% for airframe and engine.

▶**Explaining Complexity**—Eaker cited the extreme precision of today's avionics equipment as one reason for its increased complexity. For instance:

- Time intervals less than one-millionth of a second must be accurately measured.
- Long-range distances must be measured to within a few feet.
- Computers must operate in a fraction of a second to predict the future location of maneuvering targets.
- Devices must be able to instantly jam, and counterjam, enemy radar.

▶**Complacency?**—An example which Eaker cited to show recent changes in weapons thinking, might actually in-



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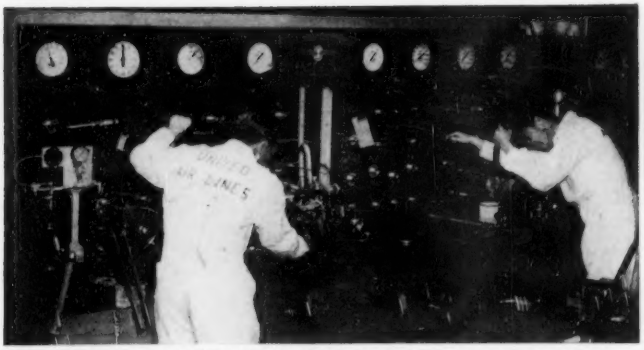

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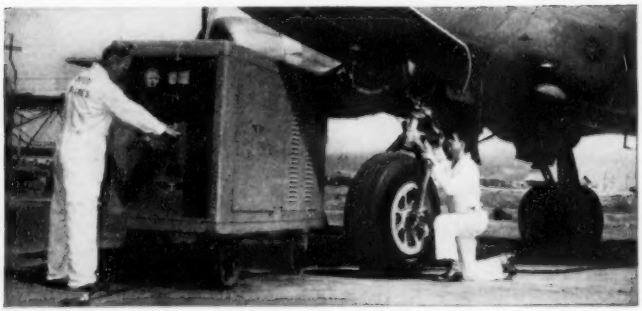

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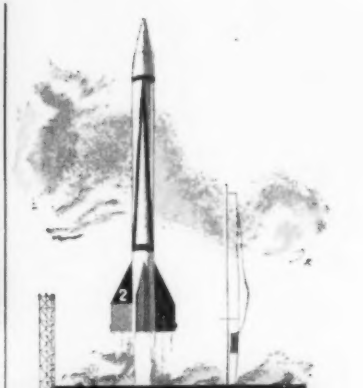

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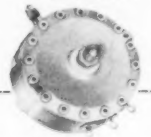

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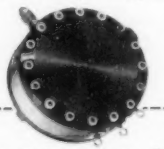

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dicate some complacency on the score of complexity.

He said that in discussing a certain important new device, an estimate was requested of the number of vacuum tubes which would have to be added to the airplane if the device were used. The answer was "300 or 400."

Eaker found this startling because "it shows that a difference of 100 vacuum tubes is looked upon as a relatively unimportant matter. There was a time not so long ago, when 100 vacuum tubes was the electronics quota for a squadron of aircraft and now they merely represent a margin of error in forecasting the complexity of just one electronic device."

▶**Little Wonder**—The increasing use of avionics equipment and its growing complexity set the stage for Eaker's statement that in some of our later aircraft types, avionics equipment represents 60% of the plane's total cost.

Eaker cited a statement by former Mobilization Director Charles E. Wilson that the cost of avionics equipment on today's fighter is more than the complete airplane in World War II. Eaker also mentioned a year-old government statement that at that time 32% of the average cost of all combat aircraft went for avionics equipment.

▶**Long Lead Time**—Eaker underscored the need for understanding the long lead time required to develop and get into production on complex avionics systems. He said the normal gestation period will run three to five years, comparable to that required to develop new airframes and engines.

"Great progress has been made during the past three or four years in overlapping research and development with production," Eaker said. However, even with unlimited funds and under great pressures, a new avionics system could not be produced in less than 18 months, and it would probably require three years, Eaker cautioned.

Eaker also expressed:

• **Pride in USAF's early recognition** of the need to train large numbers of its civilian employes and young officers in scientific and technical fields.

• **Approval of USAF's progress** toward developing new procurement procedures needed, Eaker said, to insure prompt development and purchase of futuristic weapons.

• **Concern over shortage** of laboratory facilities and technical personnel qualified to develop complex new weapons and armament.

• **Hope that government** and economic leaders will note the lessons of the past and prepare for the vast economic changes and human relations problems which will result from civilian uses of new military avionics developments.

—**Philip Klass**

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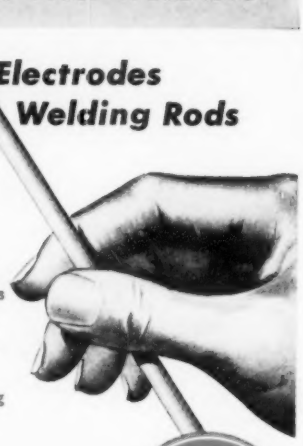

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AN/APS-42

- **Houston tells role in letter to Aviation Week.**
- **Says design was OK before RCA took over.**

Development of AN/APS-42, Navy's new transport radar, was described in AVIATION WEEK (May 12, p. 56), in the first of a series of three articles on airborne radar for storm and terrain warning.

The Houston Corp., Los Angeles, original APS-42 contractor, clarifies its own role and some of the program delays in development of the radar in the following letter:

In the 12 May 1952 issue of the AVIATION WEEK Magazine, the security wraps were taken off the latest designed navigational radar, designated the AN/APS-42. *(Editor's note: This equipment is still classified from a security standpoint and only the information released to date is unclassified.)* Designed by engineers of the Houston Corporation of Los Angeles, California, this new radar is currently being manufactured by the Radio Corporation of America in a newly constructed Los Angeles plant.

Since publishing the reference article, many of the engineers, who worked diligently and successfully on this project, have registered their disappointment that the engineering staff of The Houston Corporation was not given the proper credit to which they were entitled. Therefore, in the interest of justice and in giving credit where credit is due, the following facts are presented.

During World War II, The Houston Corporation developed and created numerous outstanding contributions in the field of photographic and related equipment for the armed services. The Corporation also became sole source of supply for the turret control sighting stations and night flying binocular sights used on night fighter planes. The Corporation also designed and manufactured a complete Radar Antenna Scanner unit, which became a component part of the then most advanced navigational radar unit, the AN/APS-10. Shortly after the war Houston entered the electronic field and submitted its own design for a complete radar to the Air Force, and subsequently completed a development contract and furnished two units to Wright Field.

A corporation's experience consists of the sum total experience of the personnel comprising the company. In this case, the engineers who designed the radar under discussion, the AN/APS-42, were the same ones who successfully designed Navy intercept radar during the last war, performed the design work on the only postwar light weight radar, and completed the design of the AN/APS-42 radar, that was fully accepted by the Navy before RCA entered the picture. As one item for consideration, Houston engineers designed the entire antenna scanner, toll and pitch stabilized, a design project few, if any, large corporations have ever accomplished. The foregoing defi-

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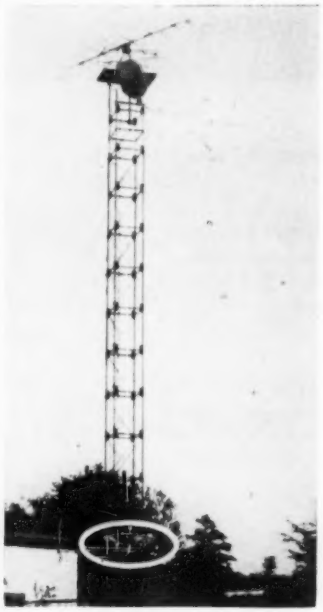
nitely refutes the statement that The Houston Corporation had no previous experience prior to taking the contract for the AN/APS-42.

During early 1947, Houston, in competition with major electronic firms, was awarded the development and production contract for the AN/APS-42. Not only did Houston take the contract at a much lower price than the nearest bidder, which is the purpose of competitive bidding, but took no exception to any part of the specification. This was not true of the other firms competing, who deleted from their bid some of the most important features now incorporated in the AN/APS-42.

Among the exceptions taken in the bids of the major competing electronic firms were the weight requirements, the option, of pitch stabilization, the roll stabilization accuracy, the option of choice of antenna pattern from the control box, and delivery schedules.

During the initial stages of design and development it was determined that the weight specification had not been realistically established and Houston repeatedly requested waivers in order to reduce weight. These requests were denied and in the fall of 1948, the corporation was urged to complete what then was referred to as the heavy weight unit, in order to meet the requirements of production, as repeatedly emphasized to the contractor. Under the threat of contract cancellation, the corporation was forced to complete the heavy weight unit, even though all parties concerned were cognizant of the weight problem. During the early part of 1949, Houston submitted three heavy weight units for test and simultaneously the corporation was advised to design a lighter weight unit with full cognizance of the contracting agencies, which redesign incorporated a weight increase for cable not previously set forth in the original specifications. The net result of this lighter weight unit incorporating many improvements in radar design and packaging created an additional cost to the contractor of approximately one and one-half million dollars for engineering and prototypes, although its final weight was only slightly below the so-called heavy weight unit. It was later determined from test reports on the heavy weight unit, which were not available until October of 1949, that with the customary amount of clean-up, these sets would have met the original specifications, with the exception of weight. This then is the real story of the redesign and delays that have taken place while The Houston Corporation was performing on the contract. Although it is readily admitted that the design experience incorporated in the sets now being manufactured by RCA are very desirable, and which were completely engineered from a design point of view before RCA took over, the fact still remains that Houston was not entirely responsible for the so-called delays and redesign.

In September 1950, subsequent to the sale of part of its business, negotiations were entered into with RCA for the eventual purchase of the radar contract. At no time was RCA requested to render any assistance whatsoever relating to the contract. RCA purchased the contract completely on an independent basis after completely assuring themselves as to the engineering design, which was then completed and the first unit in test. In fact, acceptance of the design by the Customer was a condition necessary to the completion of negotiation. In other words, RCA has made no major contribution to the basic design as set forth in the specifications, and this credit is entirely due to the sole efforts of Houston



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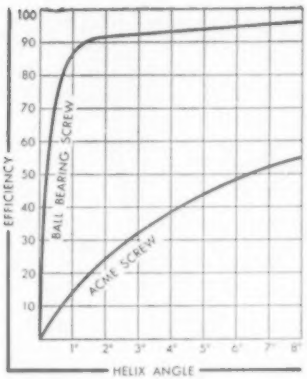

The Saginaw Ball Bearing Screw and Nut is the most efficient known method of converting rotary into linear motion. Almost friction-free, this device—of far greater efficiency than the Acme screw—is widely used in aircraft actuators.

The Saginaw Ball Bearing Screw and Nut offers many important advantages: Lower power to drive the actuator; lightness; higher speed in both directions, with less friction and heat; compactness; and a minimum of maintenance.

Each Application Specially Designed
This versatile actuator operates well under extreme loads and/or speeds in a wide range of aircraft applications. It is limited only by the power available. Because each application is a special problem, each individual actuator is designed to meet that problem.

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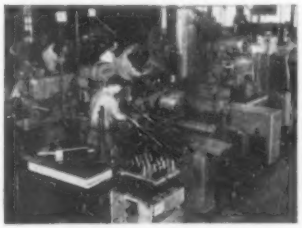
Saginaw Steering Gear Division has the machinery, skilled craftsmen, and complete inspection and engineering departments to produce in whatever quantities and at whatever speed your schedule calls for.



Extensive manufacturing facilities, plus many years of experience, make possible the outstanding high quality for which Saginaw Steering Gear products are famous.

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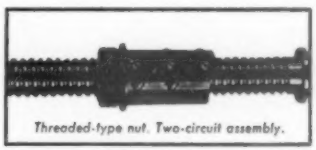
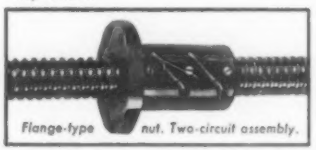


Threaded-type nut. Two-circuit assembly.



Flange-type nut. Two-circuit assembly.

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- Wide Variety of Applications

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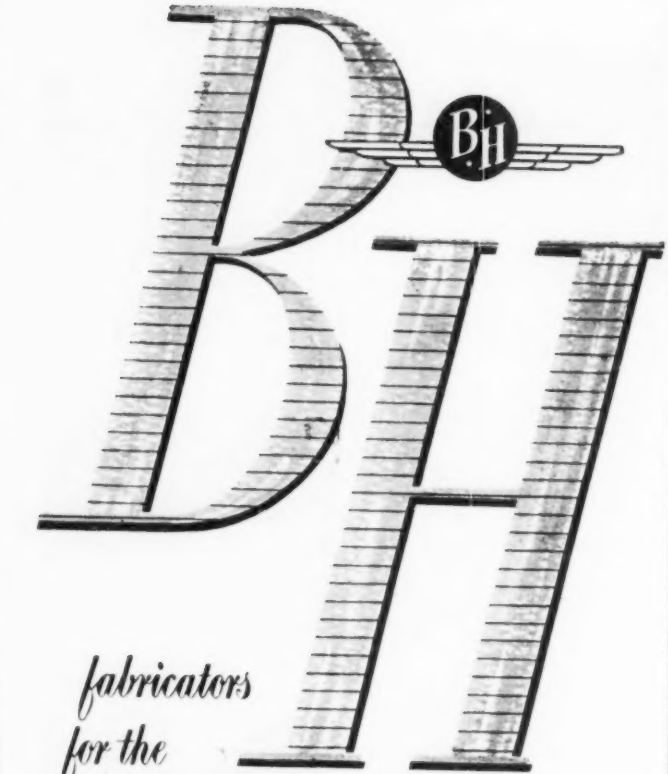


B.H. AIRCRAFT CO. INC.

FARMINGDALE, NEW YORK

engineers. RCA has, however, completed the adaptation to production, utilizing the engineers of the Houston Corporation, retained by RCA at time of purchase.

RCA did not "step in and take over"; they purchased the corporation's contract. As in all businesses, the man selling has the decision as to whether to sell or not.

The Houston Corporation, although its previous operations have been sold, is still in business and is entering an entirely new field to be announced at a later date. The Corporation is proud of its accomplishments in the past and is desirous that the personnel contributing to those accomplishments should be given the credit to which they are justly entitled.

Fred Sufficld, Chief Engineer—
Electronics
E. R. Livingston, Vice President
THE HOUSTON CORPORATION

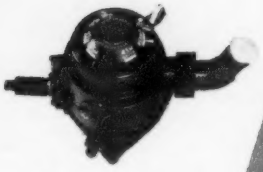
Editor's Note

(1) A Navy BuAer spokesman adds the following by way of explanation of the extenuating circumstances which led to problems and delays in the AN/APS-42 program.

"The Houston Corporation took the AN/APS-42 contract without benefit of a model and with an extemely short delivery schedule to meet. In order to try to meet the delivery schedule it was necessary to order production quantities of parts while the design was still in a fluid state. In addition, several design changes were requested by the government, while further design changes were required as the result of increased experience during the company testing period. As the result of the fluid nature of the design, the constant pressure to deliver equipments and an inventory of parts which had to be used because of economy, compromises in design were made which would have been unnecessary had an extended period of development and testing been available prior to release of the design for production. Under these unfavorable conditions and with the additional handicap of changes in personnel, three so-called 'heavyweight models' were produced and delivered to the government for test. Even prior to delivery of these models, the Houston Corporation started design of a lightweight unit. The heavyweight units were not accepted as the basis of production equipment because of their weight and troubles encountered in test. The lightweight design was essentially completed by the Houston Corporation prior to the time that RCA entered the picture. Although production experience of RCA has contributed to the units now being produced, the basic design is still essentially the product of the Houston Corporation engineering staff.

"One further comment on the Houston statement: The heavyweight radar sets were not accepted primarily because of failures during tests rather than excessive weight. BuAer does not agree that these sets could have been made to meet the original specifications by the customary amount of clean-up."

(2) When AVIATION WEEK wrote: "Houston . . . had no previous radar experience . . ." we were thinking of its lack of electronics experience as a company and the heavy electronics content of a radar set. This was



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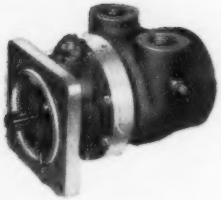
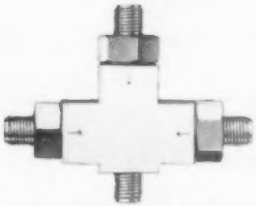
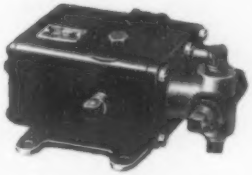


★ Vacuum Pumps

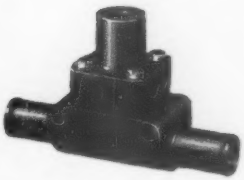


★ High and Low Pressure Check Valves

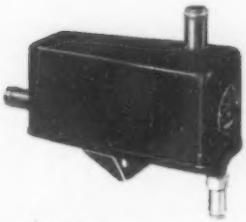


★ Oxygen Regulators (Commercial)

★ Suction Relief Valves



★ Pressure Safety Valves



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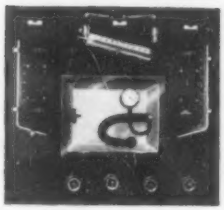

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an unfortunate choice of words because Houston did have previous corporate experience in radar antennas and waveguides. It designed a lightweight (13 lb.) scanner which could be used in place of the regular 20-lb. scanner in the AN/APS-10 radar.

It is unfortunate that we were misinformed about the complex corporate relationship between Houston and the Fearless Camera Company. (The article said that Houston had become the Houston-Fearless Co. in 1951.) AVIATION WEEK has since learned that Houston sold only a part of its assets to Fearless to form the Houston-Fearless Corp. Houston Corp. remained a separate entity holding its APS-42 contracts which it sold to RCA shortly afterwards.

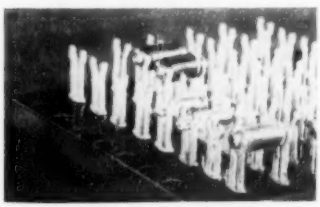
We were misinformed in saying that "after the Navy had rejected and returned Houston's initial APS-42s, they asked RCA to step in to give technical assistance." We are now told that it was an official of the Fearless Corp. (during the Houston-Fearless negotiations) who made the original contact with RCA that subsequently led to the sale by Houston of its APS-42 contract.

RCA engineers were assigned to the Houston plant in the summer of 1950 and in October of that year RCA and Houston entered a partnership arrangement on the APS-42 program, Mr. Livingston recently told AVIATION WEEK. Under this arrangement, RCA assumed the entire costs incurred to that date and agreed to direct the operation of the APS-42 program.

Under the terms of this agreement, RCA exercised an option to buy the APS-42 portion of Houston's business in October, 1951, according to Livingston. The presence of the many RCA personnel at the Houston plant during the summer of 1950, and for the year that preceded RCA's outright purchase, undoubtedly led some observers, and our informants, to conclude that RCA was giving Houston technical assistance.

We regret that interviews with qualified persons both in BuAer's radar section and in industry led us to conclude that Houston was anxious to divest itself of the APS-42 contract because of technical difficulties it had encountered. This is contrary to recent information supplied by Mr. Livingston.

Although many of Houston's APS-42 radar engineers are now working for RCA on the same project, we are sorry if the article failed to give adequate credit to Houston and its engineers for their contribution to the APS-42 design.—**Philip Klass**



MOUNTING CLIPS
Germanium diodes or resistors can be installed without soldering using these silver-plated beryllium copper mounting clips which fit into insulating panel-board holes; made by Metal Products Engr., Inc., 4000 Long Beach Ave., Los Angeles, Calif.

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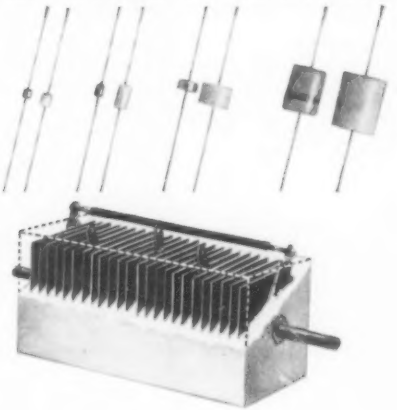

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PASSENGER TRAFFIC, which HAL hopes to increase with its new Convair 340s, and . . .

CARGO TRAFFIC, now 2 million lb. a month, keep the Island carrier busy, as . . .

HAL Plays Dual Role in Hawaii

Whether shipping people or things, air transport is rapidly taking place of steamships in the Islands.

By George L. Christian

Honolulu—Hawaiian Airlines, which claims to be the first American airline to operate aircraft exclusively as freighters, recently moved an entire 1-million-lb. pineapple plantation from one island to another. With C-47s, it hauled the plantation from Puunene, Maui, to Upoli, Hawaii, 50 miles away.

To support its first-freighter claim, HAL points out that it was using Sikorsky S-43s in 1942 to haul cargo around the Territory, at special freight rates lower than express charges.

▶ **Value to Hawaii**—Air cargo is very important to the inter-island economy of Hawaii, displacing to an increasing extent water-borne shipping. HAL's two C-47s handle about 2 million lb. of cargo a month. The island of Lanai—population about 5,000—is almost entirely air-supported, HAL spokesmen say. Clothing, food, drugs are among the necessities flown in.

The carrier's freighters are accustomed to handling fish, beef, vegetables, pianos, newspapers, washing machines, flowers, newspapers, milk (HAL is seriously considering putting in service aerial milk tankers).

Hawaiian's cargo manager, W. Wood, points out that many commodities that would go by truck on the mainland travel by air here. Families, moving from one island to another, airship their entire household furnishings. Wood says this is the cheap way to move, as the air carriers charge by weight, while steamship companies "cube" the shipment (charge by cubic dimension). Air shipments need not be crated. Wood quotes a typical saving of $8 per 1,000 on appliances.

▶ **Island Problems**—Ford Studebaker, HAL's vice president—operations and development, says the carrier needs cheaper fares. Its passengers are tourists (their number is limited by the available hotel accommodations, etc.) and the local residents (their number is about 500,000 and is not likely to change fast).

So, Hawaiian says, the way to get more passengers is to lower fares. But lower fares without a greater volume of business could be disastrous, HAL points out, taking a swipe at the fact that two carriers are now scrambling after the business in the Territory. (Competitor TPA Aloha Airline points to its own rapid growth as proof that a second carrier is needed (AVIATION WEEK Sept. 22, p. 53).

▶ **HAL Highlights**—Here are some highlights of Hawaiian's operation:

• "**Longest safety record** of any U.S. airline," company officials claim. Hawaiian has operated almost 23 years without a passenger or crew fatality.

• **HAL had flown 353,344,000** passenger-miles on Dec. 31, 1951. It broke its own single month record in August of this year, when it carried 49,689 passengers, a jump of 23% over August a year ago. Carrier reports a 10% increase in passenger and cargo volume in first eight months of 1952 over 1951.

Studebaker estimates that a 100% increase in seat-miles would boost indirect costs only 20-25%, while reducing direct costs about 2 cents a mile.

Among HAL's problems are the high Island taxes. Excise tax comes to 5% of gross profits; gasoline tax is 4 cents a gallon.

▶ **Convairs Coming**—Another way to attract more passengers is to give them new equipment. Six Convair 340s, the first to be delivered in November, fill the bill here. "The Convairs Are Coming," is being blared about the islands.

Hawaiian's Convairs will differ from Stateside delivered versions in these respects:

• **No galley.** Flights are so short, food service is not required.

• **Life rafts.** Because so much of its flying is over water, the carrier is making provisions for two 20-man life rafts and one for ten men.

• **Stretcher accommodation** is a must in Territory operation. No other means than aircraft exists for quickly moving sick or disabled persons from outlying districts to hospitals. In HAL's Convairs, part of the left side of the rear bulkhead, near the service door, has been cut away to provide access to the cabin. The backs of the last four seats

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on the left side of the cabin are removable. The stretcher will be fastened to a platform on the horizontal part of the seats. A curtain fills in the bulkhead cutout. Removed seat backs are stowed in the belly compartment to permit immediate change to seated configuration.

• **Single-stage supercharger.** Hawaiian 340s will be powered by Pratt & Whitney R2800-CB3 engines with single-stage supercharger. Relatively short hops on which the planes will be used means that they will not have time to reach altitudes where a two-stage supercharger is required.

• **Omni-Mags.** Something new in the way of commercial aviation equipment in the Hawaiian Islands will be the Bendix Omni-Mags installed on HAL's Convairs. The planes will also be equipped to take (DME) distance measuring equipment.

• **Duracote rugs.** All of HAL's 340s will have Duracote floor covering. This vinyl-impregnated Fiberglas, which is gaining wide airline acceptance, was chosen by Hawaiian because of its durability, resistance to tearing and ease of cleaning.

▶ **Island Operation**—Hawaiian is blessed with near-perfect weather. For this reason, the carrier has no interest in ILS equipment on its aircraft, and can save itself the weight of the instrument, its cost, and maintenance.

But the airline faces its own unique hazards. All the islands it serves are blanketed by Air Force and Navy firing ranges. Military action includes bombing, strafing, air-to-air gunnery and anti-aircraft firing. Areas in which action occurs are changed frequently, so Hawaiian issues a daily chart designating the current danger areas to each pilot.

▶ **First Microwave**—Radio plays a large part in HAL's operations. For instance, the airline made the first microwave installation in the Islands, and now operates the only commercial multiplex MW communications system there.

Lee Grubb, HAL superintendent of communications, explained the reasons behind the installation.

Hawaiian wanted to establish VHF communications between its operating base at Honolulu, its stations on the various islands and its aircraft in flight. But most of the airports, including the base at Honolulu, are at or near sea

SHELL AIR QUIZ

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Can you guess the percentage of fare-paying passengers between San Francisco and Los Angeles who travel by air?

( ) 33% ( ) 50% ( ) 67%

Answer:

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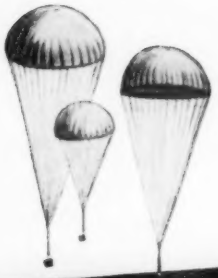

to supplies, men and equipment during war or peace

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Today the plane and the cargo chute have made the delivery of a jeep or a howitzer or cargo weighing many tons as dependably certain as the delivery of a small case of penicillin. No other means of transportation known to man can do this so swiftly and so surely . . . in many cases, no other means of transportation could do it at all.

Through research, experimentation and testing without limit, the Pioneer Parachute Company's tremendous parachute building facilities have worked side by side with the U. S. Armed services and the aviation industry to develop this unequalled transportation team. Pioneer is continuing to devote its skill and resources—mental and mechanical—to broaden the already vast usefulness of the modern parachute.

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MICROWAVE reflector is part of HAL's communications system.

level. Because every island is mountainous, in many cases large land masses were injected between the main base and station airport. This interfered with the line-of-sight propagation characteristics of VHF radio waves.

So Hawaiian installed a two-wave microwave system between its Honolulu operations base and a remotely controlled station, 13 airline miles away in the Waianae mountains at an altitude of 2,600 ft. Microwave was selected instead of land lines because land lines might be torn down during sugar cane harvesting operations, blown down by storms or knocked down by careless motorists. If buried they could be plowed up. Radio solves all this.

Grubb's faith in the microwave system has been justified by the record. He says the Motorola-built system has been in operation since July 1951 and has given excellent results. The multiplex type of microwave permits ten signal frequencies to be superimposed on one carrier beam, allowing the transmission of ten messages simultaneously.

► **Remotely Controlled Stations**—Microwave transmission from Honolulu is received by the Waianae station and retransmitted completely automatically on VHF (frequency is selected by microwave) either to an aircraft or to one of three remotely controlled, mountain-located receiving stations on other islands. Two of these island relay stations retransmit the information to airport stations on FM frequencies in the 72-76 mc. band. Standby gasoline engine-driven generators supply power in case of electrical failure.

HAL handles all its own communications, dispatch and flight control. It

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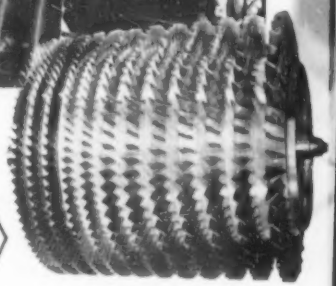
For Volume Machining of Jet Blades

A production department for machining the airfoil form of jet engine blades



Finished jet engine compressor rotor

A complete line of automatic blade finishing machines, designed and perfected at Ex-Cell-O, turns out large volumes of jet blades to the specifications of engine builders. In addition, Ex-Cell-O, through its subsidiary, Robbins Engineering Company, machines rotor wheels, inserts the blades, and assembles the complete rotors.

Plant facilities have been expanded and added employees have been trained in the machining and inspection of these precision parts and assemblies.

As one of the world's largest producers of precision parts for aircraft engines, Ex-Cell-O can help you eliminate bottlenecks and meet production schedules. For information or a quotation on your precision parts, contact Ex-Cell-O in Detroit.

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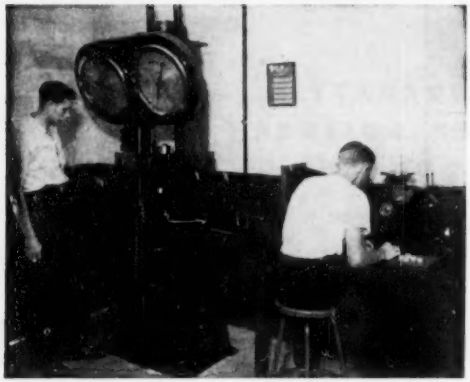

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The driven gear shown here is 5" in pitch diameter and 15" long overall. It is carburized and hardened with heat-treating distortion held within .001".

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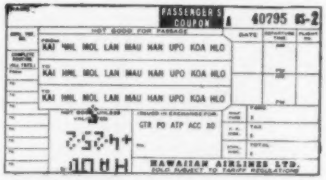

'CIRCLE-TICKETING' saves time . . .

CASH REGISTER for passenger checking save more at HAL terminals.

built all its own communications facilities and put in its own homing beacons. The carrier uses CAA VOR where it exists. It also operates supplementary airways weather reporting at five stations with a sixth being readied for use.

HAL does all of its fuel and oil checks by radio. As W. R. Faris, HAL's superintendent of stations pointed out, the pilot has to use his radio to make his radio check, so he might as well do the others at the same time. The report becomes part of the aircraft's clearance.

The system saves time, avoids confusion, eliminates fuel and oil check forms, and releases A&E mechanics from requirement of signing off fuel load; an ordinary laborer may now be used.

▶ **Speedy Ticketing**—Hawaiian's streamlined system of ticketing and cash register method of checking passengers in at the airport saves its customers considerable time at ticket counters and checkin stations.

To ticket an HAL passenger, the agent simply circles with his pencil coded abbreviations for station of origin, destination and method of charge, eliminating the time-consuming write-in method. All that is written on the ticket is passenger's name, departure date and time, flight number and fare, tax and total.

At the airport, passengers hand their tickets to an agent operating a modified National cash register. Agent uses seven rows of keys on the machine to record flight card number, pieces of

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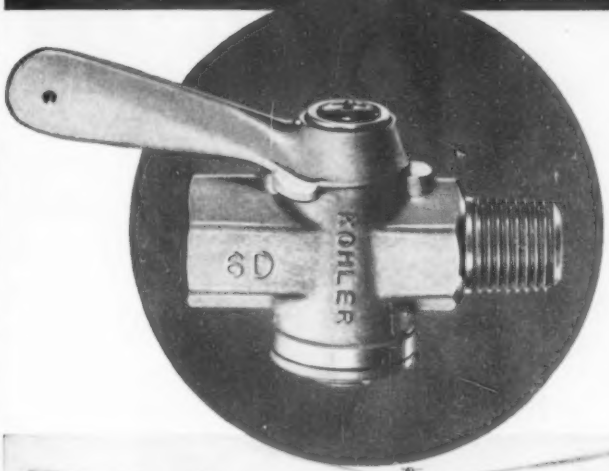

Kohler Co. is a leading supplier of precision controls to manufacturers of jet engines, commercial, military and private aircraft, agricultural and industrial test equipment, Diesel engines, automobiles, trucks, and tractors.

The Piasecki helicopter shown, now of the U. S. Navy fleet in the Pacific, has Kohler Precision Controls.

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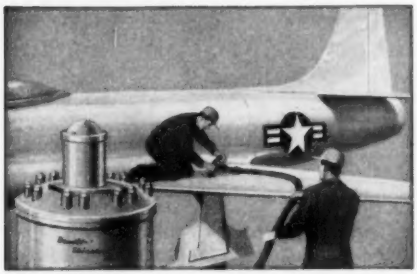

Whenever there can be no uncertainty about fineness of filtration, rate of flow or filter collapse, ***Bendix-Skinner*** gets the call. In fact, ***Bendix-Skinner*** has been handling the hardest jobs for over twenty years. From this experience have come new and exclusive filtering techniques that assure better performance on any job, *nine times out of ten.* Write for details of the filters backed by Bendix and built by Skinner.

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Bendix AVIATION CORPORATION

baggage, passenger's weight, flight indicator.

Machine runs a cumulative total of passenger and baggage weights, takes in any excess baggage charges (for which the passenger is handed a receipt) and, by keeping track of serial numbers, enables the airline quickly to identify a missing passenger.

Each passenger is handed a flight card to identify him with his particular flight. There are no baggage claim checks. A blank, colored tag tells baggage handlers the bags' destination, where the passenger picks up his own luggage. HAL has had practically no trouble with people picking up other passengers' bags.

A round-robin flight made by this reporter proved the efficiency of HAL's passenger handling plan. The flight took in the islands of Molokai (where the leper colony is) Maui (site of Haleakala, a 10,000-ft. volcano), and Lanai (the pineapple island). No fuss, no confusion, passenger terminals filled rapidly as flight time approached, emptied just as rapidly as the flight departed. The operation was smooth.

▶ **Around the Shop**—Hawaiian Airlines neatly arranged shops here are 99% self-sufficient. The airline does all its own maintenance and overhaul except for chrome plating. A tour of the facilities brought out these observations:

• **Engine valve heads and stems** are showing lead deposits as a result of increased aviation gasoline lead content. The R1830-92 engines have an overhaul period of 1,100 hr.

• **Air conditioned instrument shop** is completely equipped. It contains pressure chambers, high-powered microscopes, a Strobodyn, a Leeds & Northrup electrical standards cell used to check masters, and a lapping machine.

• **Grimes light fixtures** for instrument illumination gave such good results on a test aircraft they will be installed on the HAL's entire fleet. The hood-type units are mounted on the top circumference of each instrument. Tiny, shielded bulbs, mounted in two upper corners of the device, illuminate the instrument clearly, yet without glare.

• **Quick fix for worn exhaust stack** sleeves on front row cylinders: 2 in. of the sleeve, worn where it slip-fits over exhaust nipple, are cut off and a new section is welded in place; new sections are quickly made by cutting up old sleeves into the proper lengths.

• **Ballast,** when required in aircraft, is in 5-gal. GI water cans. Containers may be emptied as needed and the airline has no sand bags to worry about.

• **Under side of wings are painted** silver to combat corrosion.

• **A DC-3** in the hangar was having its entire belly replaced because of corrosion caused by fish blood and salt.

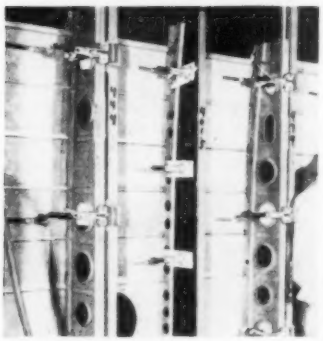
• **Special unit** built to filter Stoddard

solvent prolongs the solvent's life considerably.

► **Fish Story**—A large part of Hawaiian's business is fish. When aku (Hawaiian tuna), starts running near the southern islands, the airline is often called to pick up 40,000 lb. at a crack. Fish is dumped from the boat into specially built fish cans. Each holds about 150 lb. of aku. A C-47 packs some 40-50 cans aboard and hops over to Honolulu. The aku operation often goes on all night. HAL hauled 1.8 million lb. of fish in 1951. This required putting on nearly 100 extra sections.

Hawaiian officials are looking around for a plane specifically designed for cargo —they mentioned the Chase Avitruc and the Fairchild Packet. HAL's present fleet consists of two Douglas C-47s for cargo and 11 DC-3s for passengers. The new Convairs will go into the carrier's passenger service.

NEW AVIATION PRODUCTS



Work Clamp Speeds Packets

Toggle clamps made by Detroit Stamping Co. are speeding assembly of fuselage sections for the C-119 Packet.

The clamps keep stringers, vertical frames and beams in place on the jig while the skin is being riveted to them. They are being used at the Willow Run plant of the Kaiser-Frazer Co. which is building the military cargo plane under contract with Fairchild Engine & Airplane Corp.

Here's how the toggle clamps fit into the Willow Run assembly procedure: Stringers and frames are fastened together and secured to jig; skin is positioned on frame and rivet holes are drilled; skin is removed, placed on crimping machine so edges are joggled to accommodate overlap with adjoining skin; a joint sealer is applied; skin is repositioned on frame and riveted.

Another use of the clamps is on a fix-

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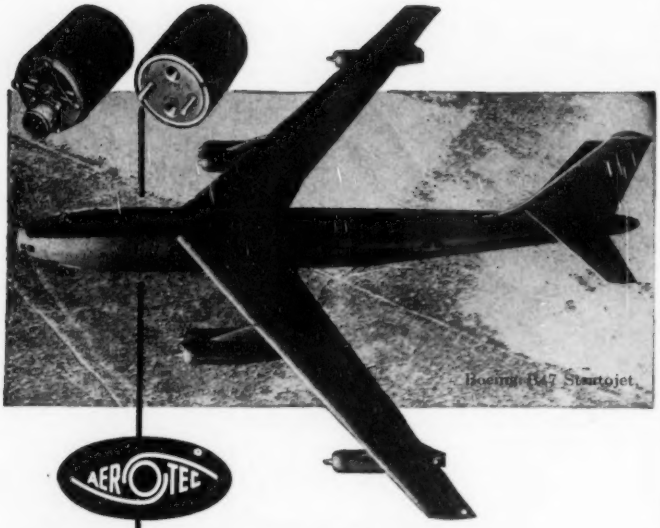

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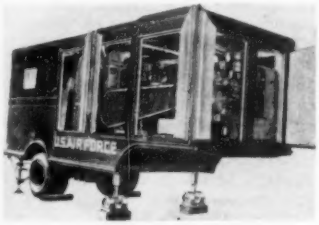
ture for holding aircraft tubing while it is dunked in a water bath to reveal leaks under pressure. The clamps also hold rubber shutoff seals on ends of the tubes to keep pressure in. This fixture is made by J. N. Fauver Co., Inc., Detroit.

Clamps are product of Detroit Stamping Co., 350 Midland Ave., Detroit 3, Mich.



Oxygen for Combat

Mobile oxygen generators for the Air Force which eliminate the need for central oxygen-dispensing plants are being supplied by Air Products, Inc.

The unit, a truck-trailer arrangement, can be driven right up to the aircraft for recharging the plane's cylinders which remain in place. Two other major functions are to provide a supply to medical and construction teams in the field—oxygen for the wounded and for welding and cutting steel with torches.

The equipment replaces the need for 220-cu. ft. compressed-gas cylinders. These are filled at central points in the U.S. and shipped overseas, taking up shipping and storage space. For Korean forces, oxygen is manufactured and bottled in Japan, but still must be shipped over and stored at the front, subject to enemy action.

Similar units also are being produced by Air Products for U.S. Navy carriers Previously carriers had to go to shore bases or refueling ships for more oxygen bottles which competed for the limited space aboard ship.

The new system includes a two-stage Freon compressor of 15 hp. running at 520 rpm. This pumps Freon into a heat exchanger which cools the atmospheric air to −65F. After compression the air is liquefied and then separated by distillation in nitrogen and oxygen, the former being dissipated into the atmosphere. The compressor was especially designed by Worthington Corp., Harrison, N. J. Generators are made by Air Products, Inc., Allentown, Pa.

Planes Fixed Faster

A blind Lockbolt which can be installed from one side to fasten two parts provides a major shortcut in many aircraft reassembly jobs.

The Lockbolts are installed similarly to blind rivets, and are used in spots where rivets don't possess the strength

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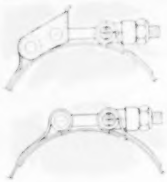
ENGINEERS NOTEBOOK

Marman

STANDARD BAND CLAMPS
FAST DELIVERY—
FAST PRODUCTION

New plant facilities and methods at Marman have lowered delivery time on standard band clamps to two weeks. This is but one of many advantages brought about by Marman's standardization of clamps for applications which heretofore required special designs. Today they are used throughout industry for all types of hose and duct connections, attachment of accessories, securing of wiring and miscellaneous equipment.



The Quick Coupler type with patented latch is particularly useful where ease and speed of assembly are important.

The T-Bolt which provides even circumferential tension finds ideal application where high strength and an especially tight seal are required.

Simple, foolproof design, light weight and ease of installation have led to the specification of Marman Clamps on virtually all U.S. aircraft.

FOR ADDITIONAL INFORMATION
WRITE FOR ENGINEERS' NOTEBOOK #21 W

MARMAN PRODUCTS CO., Inc.
11214 EXPOSITION BLVD.
LOS ANGELES 64, CALIF.

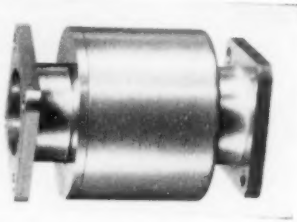
SAVE COST TIME AND WEIGHT WITH MARMAN

STANDARD CLAMPS FOR SPECIAL APPLICATIONS

needed. Huck Mfg. Co., which makes the bolts, illustrates their time-cutting potential with ten typical emergency repairs, which, in aggregate, normally took about 650 hr. to complete. With Huck Lockbolts they were completed in 9 hr.

The bolts, in ¼- and ⅜-in. diameters, have usable shear strength of 4,990 and 8,190 lb. respectively, and tensile strength of 1,760 and 3,275 lb. respectively. Huck says they are the only heat-treated, alloy-steel blind fasteners with a positive swaged lock. They have been approved by Navy and Air Force.

Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, Mich.

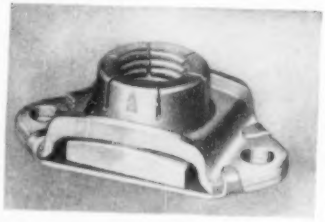


New Check Valve

A new 2-in. swing check valve for aircraft fuel and oil systems and featuring a "free-floating," soft-seat flapper is now being produced.

The aluminum valve is 4.625 in. long, weighs 1.2 lb. and has a working pressure of 100 psi. Flange fittings have been designed for easy installation and rigidness.

Allen Aircraft Products, Inc., Ravenna, Ohio.



Nut Cuts Costs

A cadmium-plated, carbon steel floating anchor nut, designed to replace AN366F and AN362F fixed anchor nuts, has been announced by Nutt-Shel Co. The advantage of the floating anchor is that alignment of holes on mating parts need not be too accurate, since nut floats ⅛ in. in all directions. This speeds installation and maintenance and cuts fabrication costs. The new nut is designed to conform with requirements of Spec. AN-N-10.

Nutt-Shel Co., 811 Air Way, Glendale 1, Calif.

Top production teams back up Boeing engineers

When Boeing engineers developed the revolutionary, flexible-wing B-47, their designs called for aluminum forgings larger than any ever before made, and for a completely new kind of wing "skin" ranging in thickness from 5/8" at the body joint to 3/16" at the tip.

New techniques, machines and procedures had to be worked out. Production is so precise that the eight-ton wing slips into place with less than a hairsbreadth of clearance. Many of these new procedures were thought "impossible" a few years ago. Today they are routine in Boeing plants. That's the kind of production teamwork Boeing engineers expect—and get.

Boeing engineers also enjoy the advantages of the finest research facilities in the industry. Their work, over the past 35 years, has given them tremendous prestige. You can share that prestige by becoming a Boeing engineer. You'll work on such long-range projects as guided missiles, nuclear-powered aircraft and the exploration of supersonic flight.

There are openings at Boeing right now for experienced and junior engineers in all fields, for aircraft

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- **TOOLING**

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You can choose our Midwest plant at Wichita, or work in the Pacific Northwest at Seattle. Boeing provides a generous moving and travel allowance, offers you special training, a salary that grows with you—and a future of almost limitless range.

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Seen at Annual IATA Conference

PAA BRASS Vice presidents ready for notes: (l. to r.) W. G. Lipscomb, E. Balluder and J. Leslie. Geneva meeting ran Sept. 15-19.

THE SESSIONS American Airlines' officers: (l. to r.) S. E. Gates, R. E. S. Deichler and AA European representative W. G. Conrad listen attentively to rate data.

RESPITE IATA public relations officer S. Ralph Cohen (left) with TWA v.p. E. O. Cocke.

TWOSOME P. G. Masefield, BEA, (left) and Ed Warner of ICAO between sessions at Geneva.

MEETING Lord and Lady Douglas have a talk with Tom Braniff (right).

SPELLBOUND M. Roushdy Bey, Misair (left), holds the attention of the Douglases and BOAC's Sir Miles Thomas.

Japanese Carriers Bid for Pacific Routes

- **JAL and JIWA are major contenders for service.**
- **Both have impressive financial backing.**

By F. Lee Moore

A major competitive development in world air routes is expected to emerge from the tangle of Japanese post-peace-treaty politics. Two Japanese airlines seek Tokyo-San Francisco certificates and plan to charge aircoach fares.

The outlook is complicated by the pending Japanese election of a new Diet, which must approve the recent bilateral air agreement with the U. S.; the new Diet may also affect the Japanese administration's decision whether to grant competitive trans-Pacific certificates to both applicants—Japan Air Lines and Japanese International World Airways.

Both seek the Tokyo-Honolulu-San Francisco route above all others. JAL has the initial advantage of being an operating company; JIWA has heavier private financing and more influential sponsors.

► **Present Status**—Japan Air Lines has operated domestic routes for a year by contracting the operation to Northwest Airlines, which subcontracted it to Transocean Air Lines.

Japan International World Airways has a ten-year flight equipment and operations contract with California Eastern Airways, which starts training JIWA personnel Nov. 1.

Recent conclusion of bilateral air agreements has paved the way for Japanese airline operation to four U. S. traffic points—San Francisco via Honolulu and Seattle via Alaska. Both want to start on the San Francisco run; and JIWA plans to run on down to Brazil from there, carrying the considerable Japanese emigrant traffic to Sao Paulo and Rio de Janeiro.

► **Government Confusion**—Recent dissolution of the Diet made the outlook even cloudier, but an indication of air policy may appear this month.

Observers in Japan and on the West Coast predict certification of the two trans-Pacific operations for 18 months, to be followed by merger of the two carriers. Rumors are rife on this situation in Tokyo, but indications are that both JAL and JIWA have about an equal chance—despite the latter's stronger financial backing. JAL has the backing of a government loan and the domestic service certificate.

Here is a summary of the two airlines' international programs:

► **Japan Air Lines**—JAL started with capital of $277,777 and a domestic service certificate on Aug. 1 last year. Terms of the Allied occupation prevented Japanese nationals from flying. So JAL gave Northwest Airlines a fixed-fee one-year contract to operate and maintain service. Northwest subcontracted the operation to Transocean Air Lines, and the one-year contract went into effect last Oct. 25.

Terms of the prime contract required 95% performance of the schedules, and this condition has been met, Northwest says.

JAL personnel handled only sales and traffic until the peace treaty Apr. 28 this year freed the company to buy planes and start training Japanese crews. An additional $555,555 was raised, and some personnel were sent to the U. S. for further airline education. A subsidiary, Japan Aircraft Maintenance Co., was set up last July 1 with capital of $138,888—owned 60% by JAL and 20% each by Northwest and Transocean—to handle maintenance for JAL and other airlines.

The carrier's domestic routes today total 4,600 mi. Transocean operates one DC-4 and four Martin 2-0-2s for the company. JAL has bought three DC-4s and plans to buy two more, also claims to have ordered two de Havilland Comets for 1955 delivery and plans to order two DC-6 or Constellation types for the projected trans-Pacific run.

► **JAL Plans**—Managing Director Matsuo had said JAL plans to own five DC-4s by the end of October, when the Northwest's operating contract expires.

But the airline reportedly will not have the personnel to do the job by Oct. 25 when the contract ends. Yet Northwest plans not to renew the contract. Latest report from NWA was that it has not sought negotiations for contract renewal, nor has the Japanese airline suggested one.

And officials of Transocean are noncommittal on the whole situation. One Transocean official indicated, however, that the four Martins would be returned

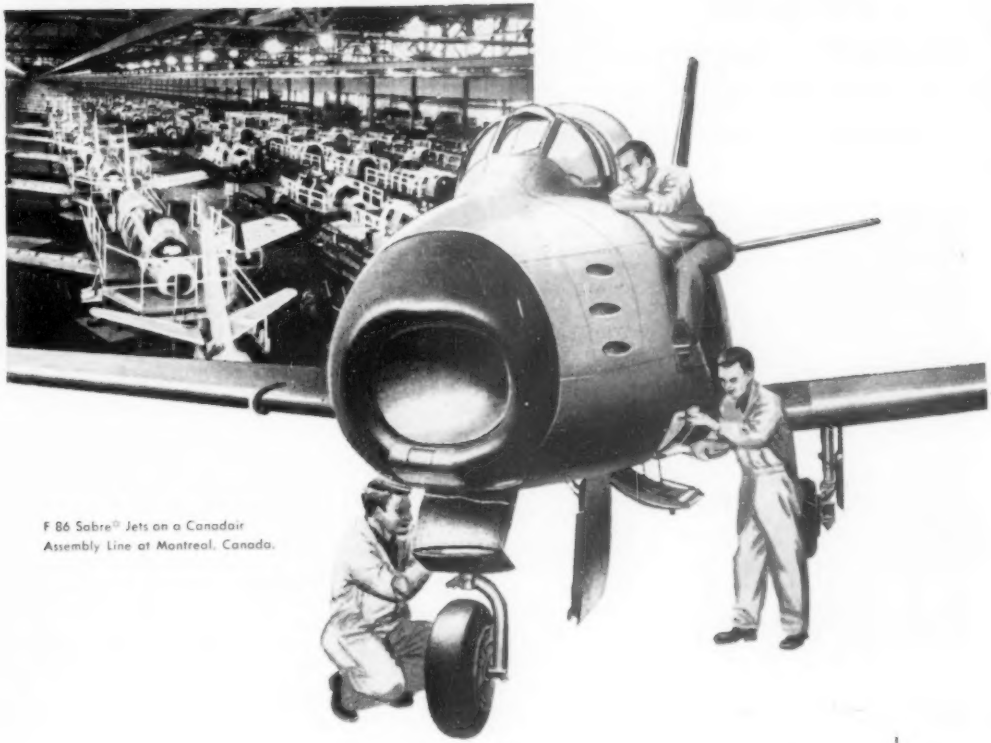
Japan's Pacific Contenders

Japan International World Airways (JIWA):

- Has ten-year training and operations contract with California Eastern Airways.
- Has the more influential sponsors and assured financing: President, Yeitaro Okada, 71-year-old industrialist and former president of the Osaka Steamship Co. (Osaka Shosen Kaisha)—major backer of the new company.
- JIWA promoters: Takeo Ito, president of Osaka Steamship Co.; Tamesuburo Yamamoto, president of Asahi Beer Co.; Shin-Ichi Hayakawa, president of Japan Express Co.; Yasusaburo Hara, president of Nippon Kayaku Co.; Taizo Ishizaka, president of To-Shiba Electric Co.; Ichiro Yanoi, president First Life Insurance Co. (Daiichi); Kozo Nomoru, president Nomura Plantation Co. of Brazil; Tsunao Okaumura, president of Nomura Security Co., which will offer the JIWA stock publicly; Goo Suzuki, president of Osaka Bank; Michisuke Sugi, multi-millionaire chairman of Osaka Chamber of Commerce; Shinzo Fugii, president of Shin-Mitsubishi Heavy Industries Co.; Osamu Tsubota, director of Nankai Railroad Co.; Shozo Murata, advisor of the Japanese Foreign Office and former president of Osaka Steamship Co.

Japan Air Lines (JAL):

- Has training and operating contract with Northwest Airlines (which subcontracted to Transocean Air Lines) that expires Oct. 24.
- Has promoter list almost as impressive as JIWA.
- JAL promoters: Managing Director, Shizuma Matsuo, director of the Japanese civil aeronautics authority during part of the postwar, non-flying occupation-restricted period; A. Fujiyama, president of Japan Chamber of Commerce and Tokyo Chamber of Commerce; I. Ishikawa, president of Federation of Economic Organizations; S. Hayakawa, president of Nippon Express Co.; R. Takahashi, Minister of International Trade and Industry; A. Kobayashi, president of Japan Development Bank; S. Asao, president of Nippon Yusen Kaisha; T. Saito, a former vice-president of the pre-war Japan Airways Co.; G. Murakami, Minister of Transportation, and M. Sugi, president of Osaka Chamber of Commerce.



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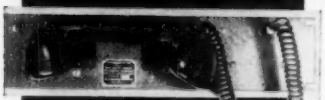

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to TAL for use in domestic charter operation.

Observers speculate that Transocean is working for a direct contract to operate JAL's DC-4s and continue the firm's training operations, but may be keeping quiet because they feel that the airline must eventually come to Transocean or some other U. S. carrier for help when the present contract expires. More help will be needed when and if overseas operations begin.

JAL now has 20 Japanese pilots in training to fly the domestic routes. It plans to use American flight captains with Japanese crews on the projected trans-Pacific routes.

► **Financing**—A brochure published this summer by the airline outlines plans for major trunk routes to Seattle, to San Francisco and Latin America, to China, Philippines and East Indies, and to London via India, Egypt and Rome.

JAL's financing looked shaky this summer while Matsuo visited U. S. manufacturers and airlines. Tokyo buzzed with rumors that company losses were running $2,000 per day, despite a 75% load factor on the 37-passenger Martins. And the carrier had a private short-term loan of $750,000 for down payment on two DC-4s, but the loan was reportedly contingent on the firm getting a $1.8-million government loan by Sept. 1 to pay for the planes.

The Japanese minister of finance kept JAL guessing right up to the deadline day, but on Aug. 29 he finally approved the loan. The company blamed its poor earnings showing on the U. S. contractors—especially Northwest for subcontracting operations while reaping a commission. However, the U. S. operators report Japan Air Line's trouble has been government red tape, plus too many company officers and investors getting into the act.

Now JAL says it expects an additional $3.2-million loan to buy the two more DC-4s and two trans-Pacific DC-6s or Constellations.

► **Japan International World Airways**—JIWA's sponsors are looking only to the U. S. and South American markets first. Their ten-year contract with California Eastern Airways gives that firm an option to buy 25% of JIWA stock at the end of that period. Plan is to start with three or four Cal Eastern DC-4s from the seven it now operates on the Pacific Airlift—two owned, two on lease-purchase, one long-term lease and two short-term lease (with negotiations to buy these two).

The company is anxious to start operating the South America run as soon as possible because Japan and Brazil have a 50-50 emigrant subsidy contract to move 405,000 Japanese workers to Brazil over the next six years. There already are nearly 1.5 million Japanese in South America, some 450,000 of them around Sao Paulo. PanAm and BOAC have flown a few Japanese to Brazil, and JIWA believes this Japan-Latin America air service holds great promise.

A trans-Pacific aircoach fare is "absolutely needed" for the Japanese emigrant traffic, according to Cal Eastern's President J. S. Solomon. He adds that he believes that JIWA plans to join the International Air Transport Assn., which fixes scheduled international fares on a unanimous, cartel-type vote each year. IATA Director-General Sir William Hildred reports some airlines opposing trans-Pacific coach fares at this time. But some Tokyo reports indicate that the Japanese will offer coach fares on high-density service, regardless of IATA decision.

The IATA traffic conference this month may decide the trans-Pacific aircoach question, and may be influenced to okay the PanAm-proposed coach fares rather than face chances of Japan breaking the association's rate-fixing power in the Pacific.

► **Other Jap Airlines?**—There are two additional applicants for Japanese air certificates. Japanese-American (Nichibei Koku) is supported by Pan American and the Hankyo Railroad. It seeks a domestic Japanese service certificate only, and is reportedly in a strong position to get it.

Another line, Daiwa, has just filed for domestic rights and is reportedly interested in international routes.

United Pilots Give Views on Convair 340

A United Air Lines pilot evaluation of the new Convair 340 adds a few safety criticisms to the generally laudatory report recently issued by the Air Line Pilots Assn. (AVIATION WEEK Sept. 29, p. 90).

The UAL pilot report praises the Convair 340 generally, but indicates that both United's management and pilots have found Convair loath to make any changes on the airplane. Here are high points cited in the report:

• **The new taxi light** moved to the nose gear throws a beam across the pilot's vision in a nose-high landing attitude. United pilots indicate this might have contributed to UAL's first 340 landing accident. Convair says that is impossible. Pilots want the light located in the nose as in the Convair 240—they say it's more useful as a warning light in the air than for taxiing. United, however, disagrees with its pilots on this plan, saying the nose should be left empty so it will be ready for the era of airborne airline radar. Pilots retort that they think UAL is more concerned about keeping a perfect "United" let-

tering job painted on the plane's nose.

• **Fuel strainer location** in the main wheelwell of each engine nacelle may be a hazard, pilots warned before the first landing accident. After the accident, which blew both tires on the right wheel and threw sparks from the rims, the strainer was found open with fuel spilling out, the pilots report. They seek protection or a new location for the strainer to prevent damage from flying objects or projections during wheel folding.

• **Dural oil tank protection** is sought for the same reason. This is located in the wheelwell also, with little clearance from the folded wheel. Convair reportedly says there will be no trouble here from loose treads, stones and sticks, but the pilots say a steel plate or mesh protection is desirable.

• **Feathering control** location on the cabin ceiling by Convair has been moved by United to the fire-control panel, as recommended by the pilots. Convair, at last report, however, still was installing the feathering lights and buttons on the roof.

• **Mixture control lever location** beside the carburetor heat control on the throttle control quadrant might lead to accidental mixture cut-off instead of intended carburetor heat supply, pilots noted; United placed a lock on the mixture control to prevent this.

• **Emergency exit operation** is reported to be too complex. A UAL pilot claims that a privately conducted experiment found one person who took 12 min. to figure the way out, some who took 4-6 min., and "very few" who did it in less than a minute.

E. African Airways Registers Deficit

(*McGraw-Hill World News*)

Nairobi—The government-owned East African Airways suffered a $212,800 loss in 1951—more than double its 1950 deficit—despite an increase of 31% in number of passengers flown and a 29% rise in revenue. Heavy operating costs are blamed for the loss.

Last year EAA flew nearly 64,000 passengers and covered more than 2.5 million miles. Revenues were approximately $2.4 million.

Canada Licenses U.S. Charter Firms

Two U. S. aircraft charter companies have been licensed by the Canadian Air Transport Board to operate within stipulated Canadian areas. Gopher Aviation, Inc., Rochester, Minn., may pick up passengers and cargo within 50 mi. of its base and operate in five

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The other operator is Lake County Air Service, Inc., Waukegan, Ill. It can operate planes having a disposable load not greater than 1,100 lb. to resort points in the neighborhood of Kenora, Ont. Traffic must originate within 50 mi. of the operator's base.

CAB Firms Up Rate Policy for Aircoach

One outcome of Civil Aeronautics Board's "general fares investigation" may be to stop American and Eastern from charging first-class fares on the New York-Washington segment of their coach flights, CAB officials indicate.

Recent Board refusals to allow double-standard pricing of coach service elsewhere are the tipoff on firming up the expected coach policy.

Although the Board has prevented airlines from charging first-class rates on segments of any other coach flights, American won a split-decision reversal of that policy when it came to the New York-Washington segment of its transcontinental coach.

Eastern at the time was charging coach fares on the New York-Washington part of its north-south coaches. But when AA got the special permission not to, Eastern automatically became entitled to similar freedom on the same route.

However, since that time, Eastern and TWA have been denied permission to do it elsewhere. Eastern asked CAB approval of first-class fares on the Detroit-Cleveland and Mobile-New Orleans sections of coach flights, but was refused. TWA recently proposed a first-class rate on the New York-Philadelphia segment of its New York-Philadelphia-Chicago-Kansas City coach joining the older Kansas City-Los Angeles coach service. But the Board pointed to the Eastern experience and TWA agreed to file coach fares all the way through.

Strike Threatened

Air Line Pilots Assn. has notified the Atomic Energy Commission that the pilots of AEC's contract air transport operator, Carco Air Service, Albuquerque, have authorized a strike unless the carrier recognizes their bargaining rights under the Railway Labor Act.

Carco claims it is not a common carrier and hence not subject to the Railway Labor Act. The company is an air taxi operator flying scheduled and nonscheduled transport flights from Los Alamos to University of California and elsewhere for the AEC under contract. About 12 pilots are involved.

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SEARCHLIGHT SECTION ADVERTISING CONTINUED ON PAGE 90

SHORTLINES

▶ **Air Force** has a C-46D under bailment contract to civil C-46 operators' "C-46 Engineering Foundation" for engine test in Miami for 60-90 days to improve cooling and fire protection. American Airmotive's Airframe division chief N. H. Golden will supervise and CAB chief pilot R. V. Garrett and CAA and pilot representatives will observe.

▶ **Air Line Pilots Assn.** brief to CAB in the Delta-C&S merger case finds major backslips in the employment protection provisions from those of the ALPA-approved Braniff-MCA merger: No help to probationary employes, and no compensation for loss from forced sale of a home. This is unfair, ALPA says, "when we consider that . . . (C&S Chairman Carleton Putnam) will walk away from this merger with a million dollars. . . ."

▶ **Air Transport Assn.** directors' committee for selecting an ATA president or executive vice president meets Oct. 15 in New York, but observers believe discussions will be general. Any new top executive for ATA would likely be picked after the national elections, they say.

▶ **American Airlines** has DPA certification of five-year amortization for 80% of $12,603,500 of flight equipment.

▶ **Braniff Airways** has DPA certification of five-year amortization of 80% of 20 Convairs at $11,556,599.

▶ **British European Airways** says it's the first in Europe to exceed 200,000 passengers a month—hauled 204,800 in August, almost equal to BEA's entire first year, 1946/7.

▶ **British Overseas Airways** claims its first fiscal-year profit for the year ending Mar. 31 with net profit of $769,997 compared with the previous year's loss of $12,783,198. Revenues rose 39% to $93,990,014 while operating expenses gained only 16% to $90,061,443. Load factor gained from 60% to 66% while break-even load factor dropped from 75% to 65%, BOAC says.

▶ **Flying Tiger Line** August freight traffic gained 22% to $569,815 over July. It was 60% over a year ago.

▶ **International Air Transport Assn.** director general Sir W. P. Hildred's annual report notes that "we have hardly scratched the surface of all-cargo transport."

▶ **National Airlines** has DPA certification of 5-year amortization of 80% of eight DC-6Bs at $8,847,266, four DC-7s at $6,972,880 and eight Convairs at $4,614,508.

▶ **Northwest Airlines** directors are reported searching for a successor to president Croil Hunter. CAB Chairman Donald Nyrop has been asked, and is fairly well assured of support of the NWA pilots, but he has indicated he probably won't take the job. . . . Company load factor Sept. 1-22 at 72% compares with 73% a year ago. . . . Reports August's 78,463,526 revenue passenger miles up 14% from a year ago. Load factor was 74%.

▶ **Ozark Air Lines** temporary mail rate set by CAB is 88.40 cents a mile. The CAB order does not estimate annual mail revenue this rate may yield.

▶ **Pan American World Airways** claims a nonstop New York-Frankfurt record of 12 hr. 42 min. (with 86 passengers aboard a DC-6B). . . . Company last week replaced DC-4s with Connies on 50 flights weekly on U. S.-Latin America service.

▶ **Resort Airlines** reportedly will step up its present bi-monthly air tour service from the U. S. to Guatemala to a weekly basis. The carrier uses C-46s on this tourist route.

▶ **Trans World Airlines** New York-Houston interchange with C & S is approved by CAB Examiner W. F. Cusick. But it will not compete with Eastern, as this new service has five stops and is designed primarily to bring Pittsburgh its first service to Memphis and Houston. . . . TWA has two other interchanges pending: Miami-West Coast via Eastern-Braniff—TWA to compete with American's interchange service; and Minneapolis-Los Angeles via interchange with Braniff at Kansas City, but the CAB examiner urges Western route extension Salt Lake to Minneapolis instead, although WAL sold a similar route, L. A.-Denver to United.

▶ **United Air Lines** has withdrawn its planned Chicago-Portland-Seattle air-coach because CAB insisted that a Denver stop be added since UAL has no route certificate for Chicago-Portland, only a special exemption. . . . Company plans to keep winter schedules near peak levels of this summer. Delivery of more Convairs will offer more service later, UAL says. . . . Installation of dual VOR navigation equipment will soon enable United to shift to staticless VOR as its primary navigation aid.

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P-5414, Aviation Week
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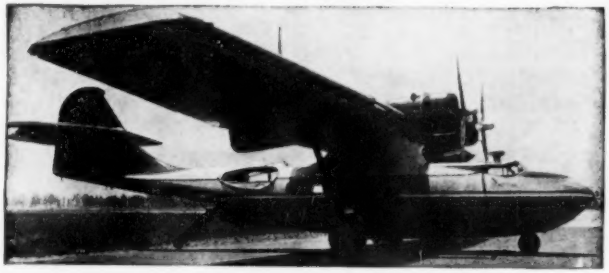

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11	14601-1F-B1	Eclipse	Gyro Indicator
71	828TY13Z2	Weston	Oil Temp Indicator
26	827TY14Z2	Weston	Cyl Head Temp Indicator
40	119868	Weston	Carb. Air Temp Indicator
10	15401-1	Eclipse	Amplifier (PB10)w/ED3 MOUNT
66	10078-1AG	Eclipse	Gyro Indicator
62	CQ-9	Eclipse	Clutch Switch (PB10)
20	12078-1	Eclipse	Amplifier (PB10)
57	MF45-3911-20Z	Vickers	Hydraulic Pump (3000PSI)
327	PF4-713-20BCE	Vickers	Hydraulic Pump
75	1416-12C	Eclipse	Starter
142	28008	Airesearch	Jack (Cowl FLAP)
6	12011-1	Eclipse	Transmitter
85	3123-3A	Eclipse	Warning Unit
45	AN4103-2	Clifford	Brass (Valve AU4785) Oil Cooler
120	MF9-713-15A	Vickers	Hydraulic Pump
550	TFD 8600	Thompson	Fuel Booster Pump
125	D7818	Adel	Anti-icer Pump
250	AN4014	Erie Meter	Wobble (D-3) Pump
1000	AN5780-2	G.E.	Wheel & Flap Position Indicator
400	AN5780-2	Weston	Wheel & Flap Position Indicator
115	P4CA2A	Parker	Primer
70	AN3213-1	Scintilla	Ignition Switch
450	A-9 (94-32226)	Nasco	Ignition Switch
90	JH950-R	Jack & Heinz	Starter Motor
53	AN6203-3	Bendix	Accumulator 10"-1500 P.S.I.
140	K14949E	Marquette	Windshield Wiper Kit
188	EYLC-2334	Barber-Colman	Control
11	12086-1C	Eclipse	Amplifier
250	558-1A	Eclipse	Oil Separator
100	716-3A	Eclipse	Generator (NEA-3A)
89	318	Edwards	Horn
230	921-B	Stewa-t-Warner	Heater (200000 BTU)
97	6041H-146A	Cutler Hammer	Relay (B-12)
22	0655-D	Aro	Oxygen Regulator
65	ASDC2	CO2 Mfg. Co.	Fire Detector
384	564-2A	Eclipse	Oil Separator

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Quantity	Part No.	Description
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500	3506	Flange
130	8288	Follower Ass'y
814	35814	Blower Ass'y
53	48362	Shaft
75	48363	Shaft
56	48392	Sump
390	48461	Gear
78	76236	Gear
1178	84289	Bearing
113	84487	Housing
77	84591C	Nose Housing
200	48350-D	Crankcase Ass'y
200	84083	Cylinder
100	84084	Cylinder
200	84085	Cylinder

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19	1375F	Holley carburetor
407	SF9LN-2 (manufacturer's part No. 10-12453-6 Spec. AN9511)	Bendix Scintilla Magneto
42	SF5RN-12 (manufacturer's part No. 10-26170-1)	Bendix Scintilla Magneto
185,000	LS4AD1	Spark Plug (Aero)

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SO THEY TELL US

(Aviation Week's staff here and abroad talk to hundreds of important aviation people. Here are gleanings from last week's interviews, not included elsewhere in today's 100-page issue.)

Industry

U. S. industry rumblings over plans to purchase many NATO planes in Europe were increased by information that the British are offering the Hunter and Swift for off-shore sale at a figure about half the price of a comparable U. S. fighter, delivered within the same time limit—1955.

More labor problems seem ahead for North American, despite settlement of the recent strike threat there through government intervention. The UAW CIO will push its thesis that auto rates should govern aircraft wages. "The issue from now on must simply be . . . 'How big is the differential and how fast can you close it up with wage increases,'" according to one union source.

Douglas X-3 was moved to Edwards for flight tests. It's now official that Bridgeman will pilot the new supersonic craft, as noted here in August.

Aircraft industry people on the West Coast watch with interest experiments under- way with titanium tubing.

Douglas A3D was trucked through picket lines at the El Segundo plant and sent to Edwards for flight tests.

Despite USAF contention that drag parachutes are effective landing brakes, Northrop's F-89 doesn't use them. Company feels jets should be able to slow without a "crutch," and refuses to consider the idea.

Top Douglas engineers, back from Korea, still feel there's a future for the AD Sky- raider. Jets, they say, must slow down to prop-driven speed to hit ground support targets, anyway.

North American, fighting kinks in the F-86 radar, feels the D is being neglected while USAF pushes output of day Sabres for Korea. It doesn't disapprove of concentration on planes for combat, but it would like a little more support toward getting its D's into the air.

McCulloch's 200-hp. tandem-rotor MC-4C copter has completed company tests and soon starts CAA flight tests for certification.

Harvey Aluminum designed the Montana plant Anaconda will use to enter the aluminum business in a big way. It will produce sheet, plate, bar and extrusions.

One aspect of increased aircraft complexity sometimes overlooked is that jet engines are robbed of thrust by equipment using compressed air. North American engineers feel the limit has been reached on the Sabre. The F-86D bleeds 14 times more compressed air from the engine to run accessories than the F-86A required.

Washington

The name of Lamotte Cohu, vice chairman of Convair, was being mentioned a few days ago as a strong candidate for post of chairman of the Aircraft Production Board, replacing W. I.. Campbell—the board's acting chairman, who will resign this month.

Pentagon gossip is that John A. McCone may become Secretary of Defense if Eisenhower wins the election. The former Undersecretary of the Air Force is on old friend of the general.

Air Force and Navy Air officers say privately that despite the F-89 crash at Detroit, they will continue to stage some kind of aerial demonstrations at major shows. Both services would prefer a single national air show, on Armed Forces Day, held in a different major city each year.

The story on airline crashes and reversible props, appearing in the current True magazine, caused a sensation within CAA and CAB—until it was evident the daily press was not publicizing the story. However, several CAB members were shocked at number of inadvertent prop reversals the article reported, and asked for back issues of Aviation Week and CAB records. Members also now get the CAA's daily malfunction reports on their desks each morning. Meanwhile, a prop reversed on an American DC6 Sept. 20 as it was approaching Monterey, but pilot recovered. Cause was traced to a loose mechanical linkage, and CAB sent out immediate notices to the industry. ALPA says there are no important errors in the True magazine story. CAB and CAA are not commenting.

WHAT'S NEW

Telling the Market

Aluminum Forming is a 148-page technical manual providing detailed information on drawing and forming aluminum sheet, piping, plate and tubing, and gives data on how to select proper grades of material. Write on letterhead only to Reynolds Metals Co., 2500 So. Third St., Louisville, Ky.

Aircraft Crash Rescue Problems is analysis using actual incidents to illustrate the conclusions. It's written by George Tyron, secretary of the National Fire Protection Assn.'s Aviation Committee. The 16-page booklet costs $1.50 and may be had by writing NFPA at 60 Batterymarch St., Boston 10, Mass. . . . Bulletin describing new **jet blade contour grinder** made by Landis Tool Co., may be obtained by writing direct to the firm at Waynesboro, Pa.

Westinghouse Lamps for Aviation Service details the 299 lamps the company makes for the services, including a cross-index of the new Westinghouse lamp identifications with revised USAF 8870 series stock numbers; Navy Aviation and RAF stock numbers and part numbers. Write Westinghouse Electric Corp., Pittsburgh, Pa., or any of the company's district offices.

All phases of the Simmonds **precision push-pull control systems** are carried in a 12-page manual for design engineers. Write Simmonds Aerocessories, Inc., White Plains Rd., Tarrytown, N. Y. . . . Applications for use of hytrol aircraft anti-skid braking system and details of how the device works are explained in an 18-page brochure issued by Hydro-Aire, Inc., Burbank, Calif.

New Addresses

Teleflex, Inc., has moved to a new plant location at 337 W. Walnut St., No. Wales, Pa. Its main office is 125 So. Main St., No. Wales; mail should be addressed to P. O. Box 69, No. Wales. New phone number is North Wales 861.

Denison Engineering Co., Columbus, Ohio, oil hydraulic equipment maker, has opened a branch office at 4306 W. 63 St., Chicago 29, Ill., to serve that city and its environs and to act as central regional supervisory office. Melvin G. Sulser serves as manager of the new branch.

Stratoflex, Inc., formerly known as Aeroquip Sales & Engineering, Inc., has moved into new general offices, laboratory and factory at 220 Roberts Cutoff, Ft. Worth, Tex.

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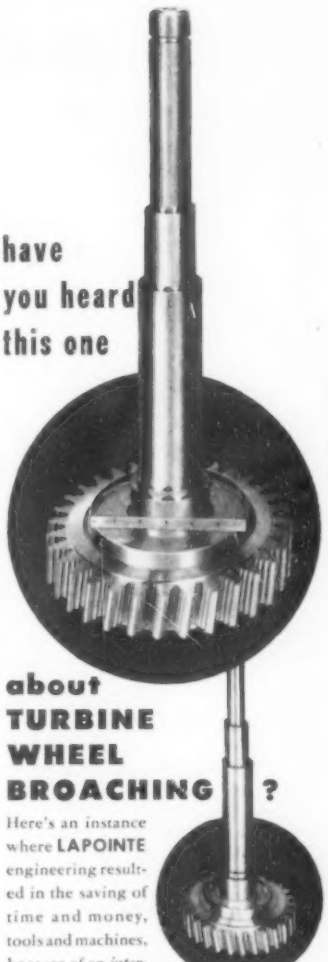

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about TURBINE WHEEL BROACHING ?

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EDITORIAL

The Lady Worker at Lockheed

The caption on this Associated Press picture says it shows women pickets jeering a worker at Lockheed.

She is being jeered because she worked on high-priority military aircraft during a strike.

The plant was trying to turn out the United States Air Force's newest jet interceptor, the Starfire. It was producing the Navy's standard patrol bomber in Korea. The plant was the sole source of the only jet training plane used to prepare all of our Air Force, Navy and Marine jet pilots for combat.

But the AFL's International Association of Machinists called a strike of some 25,000 workers.

All three of these vital planes are needed for our shooting war with the Communists. The union's issue was wages. The union struck and Korea lost, from Sept. 8 to the night shift of Sept. 28, three weeks.

No need to take our word for it that the Lockheed strike was holding up the most crucial kind of defense work. On Sept. 16 the Secretary of Defense expressed grave concern at the Lockheed strike—and another the same union had called at Douglas, where still other military planes were on the lines. "There has been a rash of strikes which have done us much harm," he said.

The union stayed out, despite the plea of the highest official in the Defense Department.

On Sept. 27 the President of the United States finally appealed to the union to call off both strikes "immediately," and "in the interest of national defense."

In his telegram, sent to both management and union, the President said he was "unwilling to assume that American citizens will permit their unresolved differences to jeopardize the safety of the nation."

Union leaders ordered the workers back to the plants, still without settlement.

But many Americans will think of our men in Korea—those who are there now, and the 18,000 who died, and the 87,000 who have been wounded, and the 12,000 who are missing.

And we have no doubt the men over there, outnumbered by Red aircraft, waiting desperately for reinforcements from the home front, will also have something to remember.

Union leaders have a grave responsibility in exercising the right to strike. So do the workers.

We suspect that Defense Secretary Lovett and our fighting men in Korea would not jeer the lady worker at Lockheed.

What Are We Waiting For?

So now comes True magazine reporting "The Secret Gamble That Can Kill You."

The "gamble" is with "human lives," and it "has gone on behind the scenes in governmental supervision of air travel safety . . . tacitly backed by elements in important sections of the aviation industry."

True is a Fawcett newsstand publication that claims over a million and a half circulation each month.

AVIATION WEEK readers will find some familiar facts in this article, written by Donald Keyhoe, formerly on CAA's public information staff. Keyhoe never had any connection, however, with our own series of articles earlier this year on the Civil Aeronautics Administration's safety operations. Much of our information did come from CAA employes, and ex-employes, who knew what they were talking about.

Keyhoe's contention is that airliners were permitted to keep operating for years, although men in both industry and government circles knew that reversible propellers on these planes were malfunctioning at irregular intervals, and might continue to do so.

The Fawcett writer purports to have gone into the details of the individual trouble reports that went to CAA and the Civil Aeronautics Board.

Some of his facts are indisputable. Some are questioned by CAA and CAB safety officials, but up to our deadline for this week's issue, neither agency had answered our request for comment on the article.

Some of these facts were reported in AVIATION WEEK early this year. We have not been able to verify all parts of the True article, although the Air Line Pilots Assn. last week said it was essentially correct.

Mr. Keyhoe's article, and others like it, can be condemned and vilified by aviation people to their heart's content, but if the government refuses to answer them honestly, the public will eventually reach its own conclusions and demand action. The longer the corrective action is delayed, the more drastic it will be.

Government aviation safety regulation needs fumigation in some offices. What are we waiting for?

—Robert H. Wood

hufford

"Push Button"

stretch-wrap forming

goes to work for

CONVAIR

This Semi-Automatic Hufford Model A-12 Stretch-Wrap Forming Machine is a recent installation at Consolidated-Vultee Aircraft Corp., San Diego, Calif. At present it is precision-forming large structural parts for the Navy's new Convair-built water based aircraft.

Once the desired stretch tensions and forming speeds for each part are chosen, the Model A-12 exactly duplicates the complete forming cycle by merely touching the control buttons. No special skill . . . no trained operator "feel" is required—yet parts are identical because *all* human element has been relieved.

Photo courtesy Consolidated-Vultee Aircraft Corp., San Diego, California

BRIEF SPECIFICATIONS

HUFFORD SEMI-AUTOMATIC MODEL A-12

Permits choice of
MANUAL or SEMI-AUTOMATIC OPERATION
via Electrical Push-Button Controls

Max. Tension Cyl. Pull	@ 2000 psi 118,000 lbs.
Min. Tension Cyl. Pull	11,800 lbs.
Max. Tension Cyl. Stroke	30"
Max. Length of Part (Ten. cyls. retracted) (Extra Length Arms Available)	268"
Min. Length of Part (Ten. cyls. extended)	24"
Max. Die Length (180° bend—full tonnage)	72"
Min. Die Length (180° bend—full tonnage)	20"
Max. Die Height	20"
Max. Sheet Width	20"
Arm Motion	Independent

LET HUFFORD BUILD YOUR SPECIAL MACHINES!

Besides the nine standard Hufford Stretch-Wrap Forming Machines, all of which are available with variations, Hufford also manufactures Precision Straightening Presses, Metal Forming Bulldozers and many special machines to customer's specifications. Ask Hufford for design suggestions, engineering aid and quotations.

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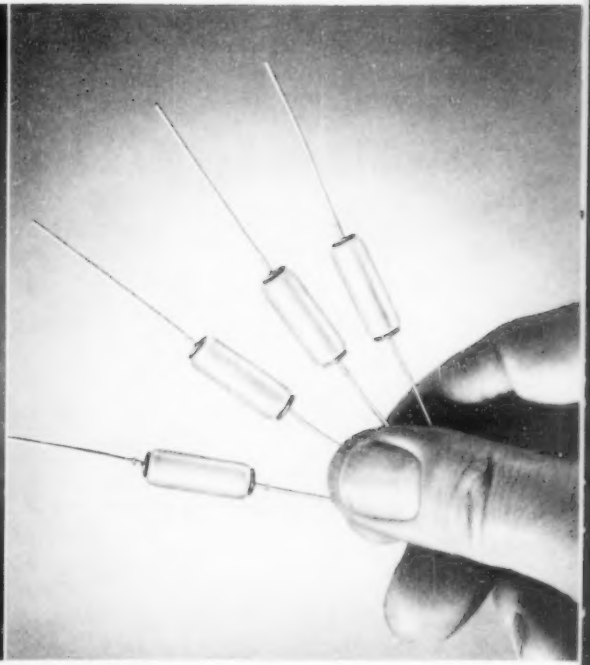
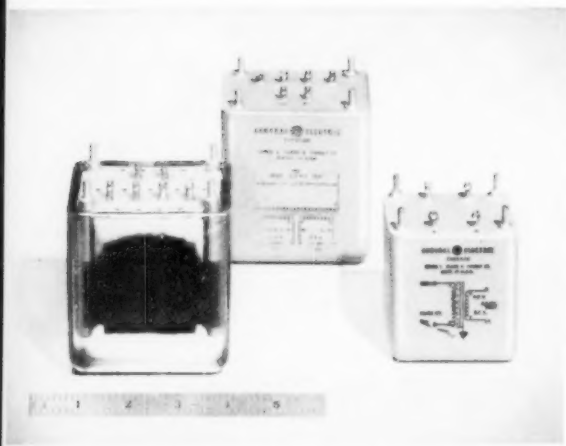
NEW HERMETICALLY SEALED RELAY'S life is *two to six times* longer than that of existing models. Its dielectric strength is rated at 1500 volts . . . its insulation will not break down after an overvoltage occurs. For more information, write for publication GEA-5729.



SMALL SIZE, LIGHT WEIGHT Tantalytic capacitors withstand vibration and extreme temperature range (−55 C to +85 C). Designed to operate at extreme altitudes, they feature low leakage currents and complete hermetic sealing. For more information, write for publication GEC-808.

New G-E Components Are Lighter, Last Longer



NEW CAST-PERMAFIL HERMETICALLY SEALED TRANSFORMERS for radar and other electronic equipment are lighter and 20% smaller than present models. Unit on left is cast in clear plastic to show internal construction. Designed to meet MIL-T-27 Grade I, the new transformers are now available in limited quantities for developmental programs.

New products like these are continually being developed at General Electric. Years of experience at turning complexity into simplicity mean low-cost, dependable products for modern aircraft electrical systems.

The next time you specify electrical components, call on General Electric. You may find that a G-E Aircraft Specialist can recommend just the equipment you need for better aircraft performance. Contact the Apparatus Sales Office nearest you. Or, write to *Section 210-35, General Electric Company, Schenectady 5, New York.*

You can put your confidence in—

GENERAL ELECTRIC